# GAS JOURNAL

## LIGHT ∴ HEAT ∴ POWER

## BYE-PRODUCTS.

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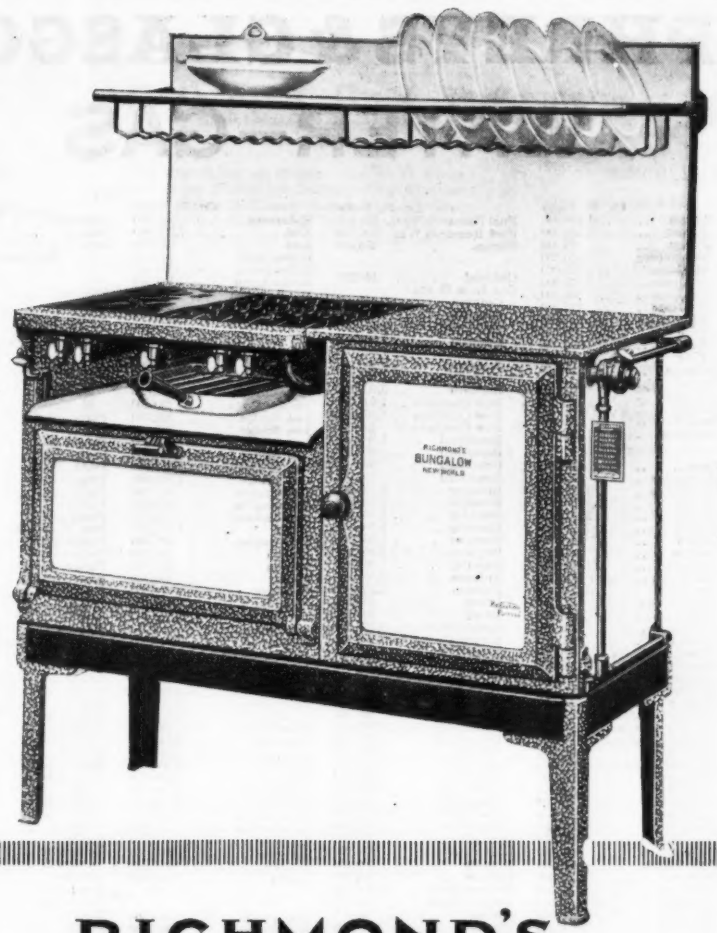
LONDON:

WALTER KING, LTD.,

11, BOLT COURT, FLEET STREET, E.C. 4.

—

1929.




# RICHMOND'S "BUNGALOW" NEW WORLD RANGE

This New Range looks particularly handsome in "Rado" Porcelain-Enamel finish. "Regulo" controlled and fitted with single oven burner and direct bottom-flue-outlet. Note specially the convenient working space provided by the top of the oven being level with the hot-plate. The spacious self-contained warming chamber can be used as an auxiliary oven for low temperature cooking.

Labour Saving

**RICHMONDS GAS STOVE COMPANY, LIMITED,**

Radiation Ltd. WARRINGTON & LONDON Proprietors

Rust Resisting

## In Porcelain Enamel Finish

# HUMPHREYS & GLASGOW, LTD.

# WATER-GAS

| | Cu. Ft. Daily |
|---|---|
| Aarhus | 800,000 |
| Abertillery | 500,000 |
| Abertillery | 100,000 |
| Admiralty: | |
| British | 800,000 |
| British | 800,000 |
| British | 800,000 |
| British | 800,000 |
| British | 800,000 |
| French | 800,000 |
| French | 800,000 |
| Agram | 200,000 |
| Aisdrie | 430,000 |
| Aldershot | 1,400,000 |
| Aldershot | 1,000,000 |
| Aldershot | 1,376,000 |
| Alkmaar | 400,000 |
| Allenstein | 200,000 |
| Alost | 700,000 |
| Amersfoort | 300,000 |
| Amsterdam | 1,000,000 |
| Amsterdam | 1,000,000 |
| Amsterdam | 2,700,000 |
| Antwerp | 1,500,000 |
| Antwerp | 1,900,000 |
| Antwerp | 1,500,000 |
| Antwerp | 1,900,000 |
| Ascot | 423,000 |
| Ashford | 250,000 |
| Asnières | 650,000 |
| Augsburg | 425,000 |
| Aylesbury | 150,000 |
| Aylesbury | 470,000 |
| Banbury | 200,000 |
| Banff | 125,000 |
| Barmen | 500,000 |
| Barnsley | 588,000 |
| Barrow | 300,000 |
| Barrow | 500,000 |
| Barry | 500,000 |
| Barry | 720,000 |
| Bath | 1,000,000 |
| Bath | 1,000,000 |
| Bath | 1,300,000 |
| Belfast | 1,700,000 |
| Belfast | 4,500,000 |
| Belfast | 1,250,000 |
| Belfast | 1,250,000 |
| Belfast | 2,250,000 |
| Benrath | 125,000 |
| Berkhampstead | 259,000 |
| Berlin: | |
| Charlottenb'g | 2,500,000 |
| Danziger Str. | 1,600,000 |
| Neukoelln | 650,000 |
| Neukoelln | 790,000 |
| Schmargendorf | 780,000 |
| Tegel | 3,500,000 |
| Tegel | 6,350,000 |
| Tegel | 245,000 |
| Bideford | 258,000 |
| Bilston | 375,000 |
| Bilston | 125,000 |
| Birmingham: | |
| Adderley St. | 675,000 |
| Nechells | 3,000,000 |
| Nechells | 3,000,000 |
| Nechells | 3,000,000 |
| Swan Village | 1,500,000 |
| Windsor St. | 3,000,000 |
| Windsor St. | 3,000,000 |
| Bishop's Stortford | 200,000 |
| Bishop's Stortford | 300,000 |
| Bishop's Stortford | 200,000 |
| Blackburn | 1,190,000 |
| Blantyre | 150,000 |
| Blois | 125,000 |
| Blois | 125,000 |
| Bochum | 530,000 |
| Bognor | 100,000 |
| Bognor | 423,000 |
| Bo'ness | 125,000 |
| Boulogne | 340,000 |
| Bournemouth | 1,000,000 |
| Bournemouth | 500,000 |
| Bournemouth | 1,500,000 |
| Bournemouth | 1,000,000 |
| Bournemouth | 500,000 |
| Bournemouth | 1,530,000 |
| Bournemouth | 2,000,000 |
| Bournemouth | 500,000 |
| Bournemouth | 2,750,000 |
| Bremen | 550,000 |
| Bremen | 950,000 |
| Bremen | 850,000 |
| Brentwood | 250,000 |
| Brescia | 588,000 |
| Brest | 550,000 |
| Bridgwater | 200,000 |
| Bridlington | 150,000 |
| Bridlington | 200,000 |
| Bridlington | 550,000 |
| Brieg | 100,000 |
| Brierley Hill | 250,000 |
| Brighton | 1,750,000 |
| Brighton | 1,850,000 |
| Brighton | 750,000 |
| Brighton | 2,750,000 |
| Bristol | 2,000,000 |
| Bristol | 2,500,000 |
| Bristol | 825,000 |
| Bristol | 825,000 |
| Bromley | 1,500,000 |
| Bruges | 200,000 |
| Bruges | 600,000 |
| Brussels: | |
| Anderlecht | 350,000 |
| Anderlecht | 350,000 |
| Forest | 1,000,000 |
| Forest | 1,000,000 |

| | Cu. Ft. Daily |
|---|---|
| Forest | 1,000,000 |
| Forest | 1,500,000 |
| Forest | 88,000 |
| Koekelberg | 1,000,000 |
| St. Gilles | 1,000,000 |
| St. Josse | 1,000,000 |
| St. Josse | 600,000 |
| St. Josse | 775,000 |
| Ville | 750,000 |
| Ville | 750,000 |
| Ville | 1,500,000 |
| Ville | 350,000 |
| Bucarest | 1,100,000 |
| Buckie | 154,000 |
| Budapest | 50,000 |
| Budapest | 1,750,000 |
| Budapest | 200,000 |
| Budapest | 250,000 |
| Caen | 250,000 |
| Cambridge | 500,000 |
| Cambridge | 1,000,000 |
| Cardiff | 2,000,000 |
| Cardiff | 3,000,000 |
| Cardiff | 1,950,000 |
| Cardiff | 600,000 |
| Carlisle | 800,000 |
| Carlsruhe | 500,000 |
| Carnarvon | 248,000 |
| Charleroi | 1,250,000 |
| Châteauroux | 125,000 |
| Châteauroux | 125,000 |
| Châtelet | 300,000 |
| Chester | 564,000 |
| Chesterfield | 430,000 |
| Chesterfield | 90,000 |
| Chesterton | 197,000 |
| Chichester | 250,000 |
| Chorley | 360,000 |
| Cie. des Compteurs | 1,150,000 |
| Cie. Lorraine de Ch. | 210,000 |
| Cie. Mines de Roche | 585,000 |
| Coatbridge | 400,000 |
| Commercial, L'n | 850,000 |
| Commercial | 850,000 |
| Commercial | 1,250,000 |
| Commercial | 2,000,000 |
| Commercial | 800,000 |
| Commercial | 2,100,000 |
| Copenhagen | 700,000 |
| Copenhagen | 2,500,000 |
| Copenhagen | 1,750,000 |
| Courtrai | 250,000 |
| Coventry | 600,000 |
| Coventry | 600,000 |
| Coventry | 800,000 |
| Coventry | 1,250,000 |
| Coventry | 350,000 |
| Cowdenbeath | 420,000 |
| Cracow | 200,000 |
| Cracow | 200,000 |
| Cranleigh | 166,000 |
| Crefeld | 500,000 |
| Crewe | 700,000 |
| Crewe | 800,000 |
| Crosfield & Sons | 1,500,000 |
| Crosfield & Sons | 1,500,000 |
| Crowborough | 150,000 |
| Croydon | 1,250,000 |
| Croydon | 625,000 |
| Croydon | 625,000 |
| Croydon | 550,000 |
| Croydon | 650,000 |
| Croydon | 1,125,000 |
| Croydon | 150,000 |
| Croydon | 3,000,000 |
| Deal | 250,000 |
| Deal | 250,000 |
| Debreczin | 100,000 |
| Derby | 1,500,000 |
| Derby | 2,000,000 |
| Deventer | 150,000 |
| Deventer | 300,000 |
| Devonport | 1,000,000 |
| Devonport | 1,100,000 |
| Doncaster | 1,350,000 |
| Dorking | 150,000 |
| Dorking | 300,000 |
| Dorking | 130,000 |
| Dover | 500,000 |
| Dublin | 2,000,000 |
| Dublin | 2,000,000 |
| Dublin | 650,000 |
| Dudley | 600,000 |
| Dundee | 1,500,000 |
| Dunedin, N.Z. | 150,000 |
| Dunedin | 275,000 |
| Durham | 200,000 |
| Dusseldorf | 1,000,000 |
| Eastbourne | 1,250,000 |
| Eastbourne | 1,550,000 |
| Edinburgh | 2,000,000 |
| Eindhoven | 1,500,000 |
| Enschede | 282,000 |
| Epsom | 225,000 |
| Epsom | 300,000 |
| Essen | 1,400,000 |
| Essen-Borbeck | 1,400,000 |
| Exeter | 1,100,000 |
| Exmouth | 376,000 |
| Falmouth | 150,000 |
| Faversham | 200,000 |
| Flensburg | 300,000 |
| Flensburg | 125,000 |
| Forst | 300,000 |
| Frankenthal | 175,000 |

| | Cu. Ft. Daily |
|---|---|
| Fuel Research Wks. | 500,000 |
| Fuel Research Wks. | 500,000 |
| Furnes | 509,000 |
| Gabionz | 140,000 |
| Gas L. & C. Co.: | |
| Beckton | 10,000,000 |
| Beckton | 7,000,000 |
| Beckton | 3,500,000 |
| Beckton | 7,000,000 |
| Beckton | 7,000,000 |
| Beckton | 5,250,000 |
| Beckton | 4,500,000 |
| Beckton | 4,000,000 |
| Bow Common | 1,000,000 |
| Bow Common | 1,150,000 |
| Bow Common | 150,000 |
| Brentford | 1,200,000 |
| Brentford | 850,000 |
| Brentford | 350,000 |
| Brentford | 750,000 |
| Bromley | 3,750,000 |
| Bromley | 3,250,000 |
| Bromley | 1,800,000 |
| Bromley | 1,350,000 |
| Bromley | 1,050,000 |
| Bromley | 1,450,000 |
| Bromley | 1,350,000 |
| Fulham | 4,500,000 |
| Fulham | 1,200,000 |
| Ilford | 650,000 |
| Ilford | 750,000 |
| Kensal Green | 2,250,000 |
| Kensal Green | 2,250,000 |
| Kensal Green | 2,250,000 |
| Nine Elms | 2,750,000 |
| Nine Elms | 750,000 |
| Nine Elms | 1,870,000 |
| Nine Elms | 2,850,000 |
| Shoreditch | 900,000 |
| Shoreditch | 2,700,000 |
| Shoreditch | 2,725,000 |
| Southall | 2,000,000 |
| Southall | 3,000,000 |
| Staines | 600,000 |
| Stratford | 1,700,000 |
| Stratford | 850,000 |
| Stratford | 2,350,000 |
| Stratford | 2,350,000 |
| Gelsenkirchen | 175,000 |
| Gelsenkirchen | 350,000 |
| Geneva | 500,000 |
| Geneva | 700,000 |
| Gennevilliers | 10,600,000 |
| Gennevilliers | 2,900,000 |
| Girvan | 235,000 |
| Glasgow | 3,000,000 |
| Glasgow | 2,500,000 |
| Glasgow | 2,250,000 |
| Glossop | 340,000 |
| Gloucester | 800,000 |
| Gloucester | 1,000,000 |
| Gosport | 200,000 |
| Gosport | 225,000 |
| Göteborg | 309,000 |
| Göteborg | 600,000 |
| Graudenz | 200,000 |
| Grays | 250,000 |
| Grays | 400,000 |
| Groningen, Holland | 500,000 |
| Guest, Keen & Piggotts, Ltd. | 1,936,000 |
| Guildford | 300,000 |
| Guildford | 200,000 |
| Guildford | 350,000 |
| Guildford | 1,100,000 |
| Guildford | 150,000 |
| Haarlem | 850,000 |
| Hamburg | 1,750,000 |
| Hampton Court | 500,000 |
| Hampton Court | 600,000 |
| Hampton Court | 1,100,000 |
| Hanley | 800,000 |
| Hanley | 800,000 |
| Hartlepool | 750,000 |
| Hartlepool | 765,000 |
| Haywards Heath | 470,000 |
| Hebden Bridge | 200,000 |
| Heidelberg | 200,000 |
| Hereford | 525,000 |
| Hertford | 197,000 |
| Hertford | 244,000 |
| Hessle | 150,000 |
| High Wycombe | 752,000 |
| Hilversum | 850,000 |
| Hinckley | 250,000 |
| Holyhead | 197,000 |
| Hong Kong | 450,000 |
| Hong Kong | 450,000 |
| Hornsey | 1,000,000 |
| Hornsey | 1,000,000 |
| Hornsey | 750,000 |
| Hornsey | 750,000 |
| Horsham | 235,000 |
| Hull | 1,500,000 |
| Hull | 1,000,000 |
| Hull | 1,600,000 |
| Innsbruck | 200,000 |
| Ipswich | 750,000 |
| Ipswich | 1,250,000 |
| Jersey | 864,000 |
| Kampen | 350,000 |
| Karlsbad | 350,000 |
| Kendal | 329,000 |

| | Cu. Ft. Daily |
|---|---|
| Kidsgrove | 235,000 |
| Kiel | 1,000,000 |
| Kiel | 880,000 |
| Kilmarnock | 500,000 |
| Kilmarnock | 585,000 |
| King's Lynn | 197,000 |
| Kirkintilloch | 360,000 |
| Kirkintilloch | 867,000 |
| Kolozvar | 100,000 |
| Lancaster | 500,000 |
| Largs | 235,000 |
| Lausanne | 250,000 |
| Lausanne | 385,000 |
| Le Mans | 420,000 |
| Lea Bridge | 350,000 |
| Lea Bridge | 350,000 |
| Lea Bridge | 400,000 |
| Lea Bridge | 1,000,000 |
| Lea Bridge | 1,500,000 |
| Lea Bridge | 1,530,000 |
| Leamington | 600,000 |
| Leamington | 525,000 |
| Leatherhead | 705,000 |
| Leeds | 1,500,000 |
| Leeuwarden | 400,000 |
| Leiden | 500,000 |
| Leiden | 575,000 |
| Leigh | 350,000 |
| Lemberg | 260,000 |
| Lemberg | 500,000 |
| Letchworth | 362,000 |
| Letchworth | 423,000 |
| Liége | 1,000,000 |
| Liége | 750,000 |
| Lille | 860,000 |
| Lincoln | 500,000 |
| Lincoln | 893,000 |
| Liverpool | 3,500,000 |
| Liverpool | 4,500,000 |
| Liverpool | 750,000 |
| Liverpool | 1,750,000 |
| Liverpool | 1,250,000 |
| Liverpool | 3,000,000 |
| Liverpool | 1,500,000 |
| Liverpool | 1,250,000 |
| Liverpool | 2,350,000 |
| Long Eaton | 430,000 |
| Long Eaton | 170,000 |
| Longton | 600,000 |
| Louvain | 800,000 |
| Lubeck | 400,000 |
| Luton | 400,000 |
| Maastricht | 200,000 |
| Macclesfield | 800,000 |
| Magdeburg | 1,400,000 |
| Maidenhead | 225,000 |
| Maidenhead | 225,000 |
| Maidenhead | 175,000 |
| Maidenhead | 175,000 |
| Maidstone | 500,000 |
| Maidstone | 500,000 |
| Malines | 500,000 |
| Malines | 575,000 |
| Malmö | 350,000 |
| Malta | 400,000 |
| Manchester | 3,500,000 |
| Manchester | 3,500,000 |
| Manchester | 1,500,000 |
| Mansfield | 330,000 |
| Mansfield | 493,000 |
| Marlborough | 100,000 |
| Mayence | 700,000 |
| Melbourne | 5,000,000 |
| Merthyr Tydfil | 300,000 |
| Merthyr Tydfil | 200,000 |
| Middlesbrough | 1,250,000 |
| Middlesbrough | 750,000 |
| Middlesbrough | 900,000 |
| M/M. Woolston | 9,000,000 |
| Monaco | 275,000 |
| Monaco | 618,000 |
| Mons | 500,000 |
| Montevideo | 1,222,000 |
| Morecambe | 333,000 |
| Moscow | 1,000,000 |
| Munich | 1,400,000 |
| Namur | 175,000 |
| Narbonne | 350,000 |
| Nelson | 400,000 |
| Neuss | 140,000 |
| Newbury | 250,000 |
| Newcastle | 2,500,000 |
| Newcastle, N.S.W. | 500,000 |
| Newport Pagnell | 188,000 |
| Nice | 900,000 |
| Nictheroy | 250,000 |
| N. Middlesex | 150,000 |
| N. Middlesex | 200,000 |
| N. Middlesex | 75,000 |
| N. Middlesex | 650,000 |
| N. Middlesex | 650,000 |
| N. Middlesex | 1,000,000 |
| Northfleet | 235,000 |
| North Sydney | 500,000 |
| North Sydney | 500,000 |
| Norwich | 1,000,000 |
| Norwich | 300,000 |
| Norwich | 500,000 |
| Norwich | 1,500,000 |
| Nottingham | 1,000,000 |
| Nottingham | 1,000,000 |
| Nuneaton | 125,000 |
| Oberhausen | 175,000 |
| Oldbury | 500,000 |
| Oldenburg | 200,000 |

| | Cu. Ft. Daily |
|---|---|
| Ormskirk | 170,000 |
| Ostend | 100,000 |
| Ostend | 200,000 |
| " Zandvoorde | 700,000 |
| Palermo | 968,000 |
| Palermo | 850,000 |
| Paris: | |
| Clichy | 4,000,000 |
| Ivry | 1,570,000 |
| Landy | 6,000,000 |
| Landy | 6,000,000 |
| La Villette | 4,000,000 |
| La Villette | 2,000,000 |
| St. Mandé | 1,570,000 |
| Paris-Plage | 125,000 |
| Pau | 550,000 |
| Pembroke | 240,000 |
| Perigueux | 360,000 |
| Perth, W.A. | 125,000 |
| Piggott & Co. | 1,530,000 |
| Plymouth | 2,000,000 |
| Poitiers | 350,000 |
| Pontypool | 120,000 |
| Port Elizabeth | 400,000 |
| Portsmouth | 1,000,000 |
| Portsmouth | 2,000,000 |
| Portsmouth | 800,000 |
| Portsmouth | 2,000,000 |
| Posen | 450,000 |
| Posen | 700,000 |
| Prague | 140,000 |
| Preston | 1,400,000 |
| Ramsgate | 430,000 |
| Reading | 1,000,000 |
| Reading | 1,000,000 |
| Reading | 600,000 |
| Redditch | 500,000 |
| Redhill | 275,000 |
| Redhill | 300,000 |
| Redhill | 1,100,000 |
| Reichenberg | 200,000 |
| Reichenberg | 200,000 |
| Reval | 350,000 |
| Rhymney | 175,000 |
| Rhymney | 250,000 |
| Riddings | 258,000 |
| Ripley | 120,000 |
| Rochester | 2,200,000 |
| Rochester | 2,800,000 |
| Romford | 300,000 |
| Romford | 350,000 |
| Rotterdam | 850,000 |
| Rotterdam | 1,500,000 |
| Rotterdam | 750,000 |
| Rotterdam | 750,000 |
| Rotterdam | 600,000 |
| Rotterdam | 2,000,000 |
| Royston (Yorks.) | 250,000 |
| Rugby | 1,000,000 |
| Rushden | 425,000 |
| Rushden | 517,000 |
| Saffron Walden | 235,000 |
| St. Albans | 700,000 |
| St. Andrews | 210,000 |
| St. Andrews | 409,000 |
| St. Gallen | 225,000 |
| St. Gallen | 225,000 |
| Ste. Ch. Gr. Paroisse | 1,320,000 |
| Sté. Pr. Ch. Kuhlmann | 1,270,000 |
| Sté. Tubes Meuse | 545,000 |
| San Paulo | 700,000 |
| Scarborough | 800,000 |
| Scarborough | 200,000 |
| Scarborough | 350,000 |
| Scarborough | 1,300,000 |
| Scarborough | 1,350,000 |
| Seaford | 200,000 |
| Shanghai | 225,000 |
| Shanghai | 225,000 |
| Shanghai | 1,600,000 |
| Shanklin | 259,000 |
| Sheerness | 200,000 |
| Sheerness | 180,000 |
| Sheerness | 200,000 |
| Sheffield | 1,530,000 |
| " Steel Proda. | 5,000,000 |
| Shrewsbury | 300,000 |
| Sidmouth | 225,000 |
| Sittingbourne | 259,000 |
| Southampton | 800,000 |
| Southampton | 500,000 |
| Southampton | 600,000 |
| Southampton | 100,000 |
| Southampton | 1,000,000 |
| Southend | 1,250,000 |
| Southend | 900,000 |
| Southend | 900,000 |
| Southgate | 400,000 |
| Southgate | 400,000 |
| Southgate | 800,000 |
| Southgate | 500,000 |
| Southport | 750,000 |
| Southport | 900,000 |
| Southport | 900,000 |
| Southport | 450,000 |
| South Shields | 650,000 |
| South Shields | 1,250,000 |
| Stafford | 500,000 |
| Stettin | 880,000 |
| Stirling | 400,000 |
| Stockholm | 1,500,000 |
| Stockholm | 1,750,000 |
| Stockport | 600,000 |
| Stockport | 600,000 |
| Stockport | 400,000 |
| Stockport | 400,000 |
| Stockton | 500,000 |
| Stockton | 250,000 |
| Stourbridge | 500,000 |
| Stourbridge | 500,000 |
| Sunderland | 2,250,000 |
| Sunderland | 300,000 |
| Sutton | 1,250,000 |
| Swansea | 750,000 |
| Swansea | 1,000,000 |
| Swansea | 450,000 |
| Swansea | 1,250,000 |
| Swansea | 2,000,000 |
| Swindon | 300,000 |
| Swindon | 450,000 |
| Swindon | 400,000 |
| Sydney | 1,000,000 |
| Sydney | 1,000,000 |
| Sydney | 1,000,000 |
| Sydney | 8,250,000 |
| Taunton | 225,000 |
| Taunton | 350,000 |
| Tawe Valley | 275,000 |
| Teignmouth | 200,000 |
| The Hague | 1,000,000 |
| The Hague | 500,000 |
| The Hague | 1,750,000 |
| The Hague | 1,500,000 |
| The Hague | 775,000 |
| The Hague | 1,500,000 |
| Tilburg | 400,000 |
| Tirlemont | 120,000 |
| Tokyo | 2,000,000 |
| Torquay | 350,000 |
| Torquay | 350,000 |
| Torquay | 320,000 |
| Tottenham | 750,000 |
| Tottenham | 750,000 |
| Tottenham | 350,000 |
| Tottenham | 1,000,000 |
| Tottenham | 1,000,000 |
| Tottenham | 1,250,000 |
| Tottenham | 2,500,000 |
| Tottenham | 1,000,000 |
| Tottenham | 500,000 |
| Tottenham | 1,000,000 |
| Toulouse | 1,800,000 |
| ToulouseNatl. Wks. | 2,400,000 |
| ToulouseNatl. Wks. | 6,200,000 |
| Tournai | 700,000 |
| Tours | 550,000 |
| Trowbridge | 250,000 |
| Tunbridge Wells | 1,000,000 |
| Tunbridge Wells | 1,000,000 |
| Tunis | 175,000 |
| Tynemouth | 1,100,000 |
| Tynemouth | 1,100,000 |
| Ulm | 400,000 |
| Utrecht | 1,000,000 |
| Utrecht | 1,000,000 |
| Uxbridge | 752,000 |
| Vancouver | 3,800,000 |
| Verviers | 1,000,000 |
| Vienna | 3,500,000 |
| Vienna | 2,500,000 |
| Walsall | 750,000 |
| Walsall | 375,000 |
| Waltham | 400,000 |
| Waltham | 140,000 |
| Wandsbek | 125,000 |
| Wandsworth | 1,800,000 |
| Wandsworth | 4,230,000 |
| Wanganui, N.Z. | 376,000 |
| Ware | 150,000 |
| Ware | 282,000 |
| Warwick | 125,000 |
| Wasmuel | 500,000 |
| Watford | 300,000 |
| Watford | 350,000 |
| Watford | 400,000 |
| Wath | 430,000 |
| Weimar | 100,000 |
| Wellingborough | 525,000 |
| Wellingborough | 525,000 |
| Wellington, N.Z. | 350,000 |
| West Bromwich | 550,000 |
| Westgate | 250,000 |
| Weston-Mare | 350,000 |
| Weston-Mare | 350,000 |
| Weston-Mare | 150,000 |
| Weston-Mare | 150,000 |
| Wexford | 100,000 |
| Weymouth | 400,000 |
| Weymouth | 100,000 |
| Weymouth | 658,000 |
| Whitstable | 423,000 |
| Widnes | 500,000 |
| Wiesbaden | 850,000 |
| Winchester | 225,000 |
| Winchester | 125,000 |
| Winchester | 410,000 |
| Woking | 400,000 |
| Wolverhampton | 1,500,000 |
| Wolverhampton | 1,000,000 |
| Wolverhampton | 250,000 |
| Wolverhampton | 400,000 |
| Worthing | 525,000 |
| Yarmouth | 500,000 |
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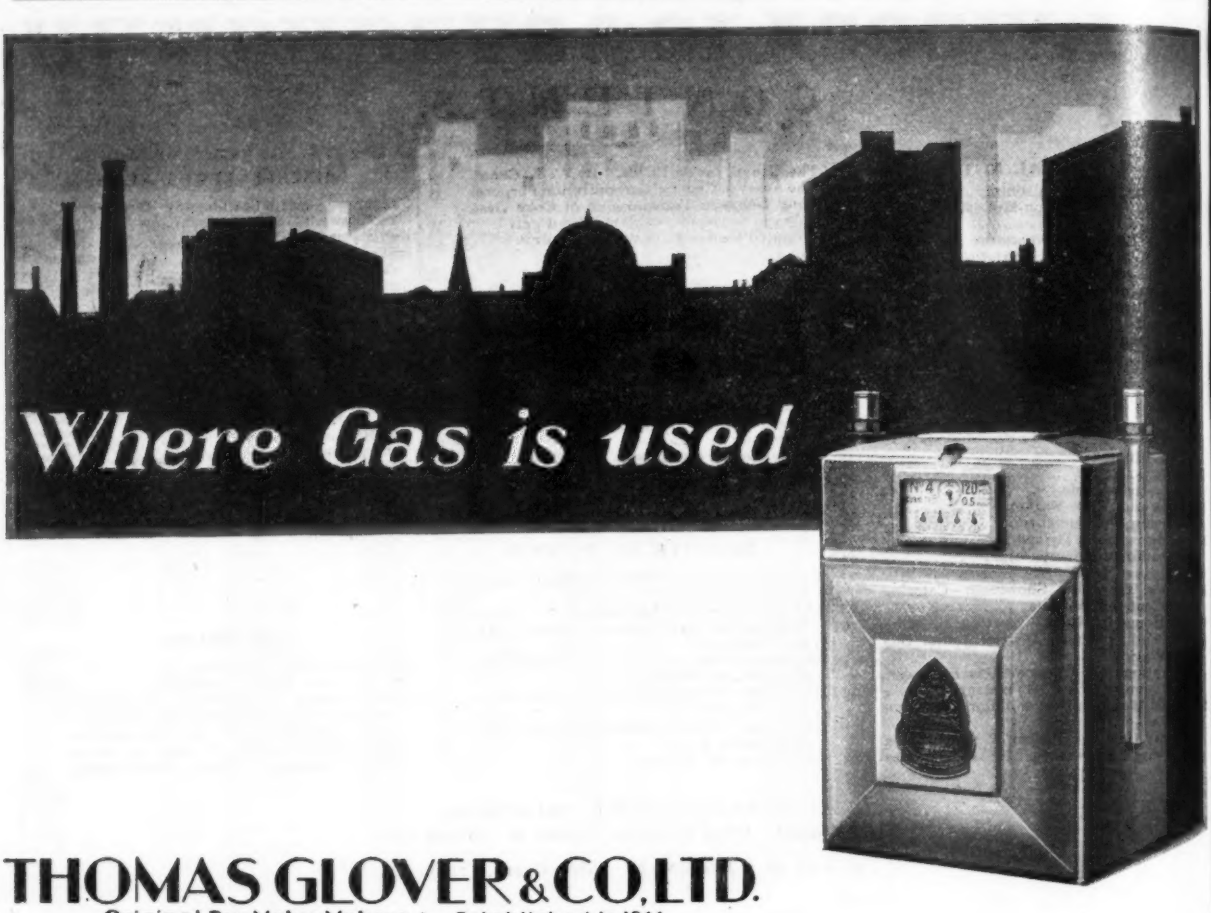


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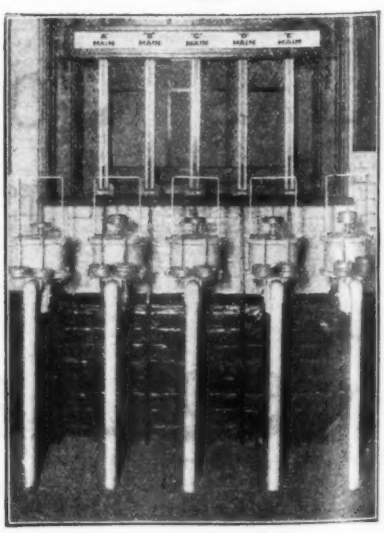

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VOL. CLXXXVI. No. 3437.] WEDNESDAY, APRIL 3, 1929 [81ST YEAR.


# Editorial Notes.

## A Committee on Gas Poisoning.

In reply to a question in the House of Commons on Tuesday of last week, Sir Philip Cunliffe-Lister (President of the Board of Trade) stated that his attention had been directed to the statistics of gas poisoning. More particularly since the report of the Committee on Carbon Monoxide in 1921, the situation had been carefully watched, and relevant information collected. He drew attention to the need there was to bear in mind how large a proportion represented cases of suicide, but went on to say that he proposed to appoint a "small, but experienced, Committee" to review the developments which have taken place since the Committee above referred to sat. Presumably, therefore, we are in for another inquiry, which will occupy some of the time that is badly needed for other work.

Doubtless those actively engaged in the gas industry, while offering to the proposed Committee all the help in their power, will wish, as we do, that the inquiry was to have another object. Reference to the report of the proceedings in the House of Commons which appears on a later page of this issue of the "JOURNAL," will reveal the terrible significance of the figures quoted, though not in the direction which the proposed appointment of this Committee would indicate. The questioner (Mr. Bowerman) stated that during the past fifteen years the deaths due to "coal gas poisoning" had increased from 170 to 1142; and the President of the Board of Trade, dissecting the figures, showed that in 1927 the number of suicides by gas reached the astounding total of 943; the other deaths being 150. Nevertheless, the inquiry is, presumably, to be, not as to why in one year nearly 1000 persons should deliberately end their lives by inhaling gas which is manufactured and sold for other purposes, but in regard to the deaths (less than one-sixth of this total) from gas poisoning occurring in all other circumstances—from pure accident, from faulty fittings, from gross negligence, and also the cases in which coroners, while the facts have been suspicious, have very naturally (and quite rightly) given the victims the benefit of the doubt.

There is not the least intention on our part of belittling the importance of even a single death; but complete immunity from accident cannot be hoped for in connection with anything that is used so universally as gas. Would the proposed Committee not find a much more pressing problem to tackle in connection with the appalling motor accident statistics? Only last Monday, a correspondent to "The Times," speaking of motor speed limits, referred to the "killing of 5000 persons a year, and the maiming of perhaps 150,000 to 200,000, a large number of them undoubtedly injured for life." Here, indeed, is subject-matter for inquiry by a "small, but experienced, Committee." Such figures as these make the accidental deaths from poisoning by gas (which, we imagine, is even more generally used than motor vehicles) appear extraordinarily small; but if the inquiry is to be related to gas, we would rather it were directed to finding out whether something cannot be done to lessen the widespread desire for self-destruction to which the 943 suicides by gas in a single year testify. Gas provided the means; but what created the desire? There must be room for improvement in a life which so many persons determine to quit.

In reply to Mr. Will Thorne, it was stated by Sir Philip Cunliffe-Lister that gas has been "much better since the therm system was introduced, and, what is more to the point, people are now paying for gas as gas." But still there is this question of carbon monoxide. The information given to the House by Mr. Bowerman was that during the past fifteen years the proportion of carbon monoxide, "the chief poisonous constituent of coal gas," has been raised from 7 p.ct. to as much as 15 p.ct., and in some cases to 20 p.ct. This increase "militating against the recovery of persons accidentally poisoned by gas," he was desirous of knowing whether the President of the Board of Trade was prepared to give consideration to the recommendation of the Committee appointed in 1921, to the effect that, if the freedom from limitation of the proportion of carbon monoxide was proved to be accompanied by unexpectedly unfavourable results, the attention of Parliament should again be directed to the matter.

## Non-Limitation of Carbon Monoxide Recommended in 1921.

EVENTS move rapidly in these days, and so much has happened since 1921 that the report in that year of the Departmental Committee on Carbon Monoxide appointed by the Board of Trade may not now be fresh in the memories of some of our readers. It was a Committee set up in accordance with the provisions of sub-section 4 of section 2 of the Gas Regulation Act, 1920, to inquire into the question of whether it was necessary or desirable to prescribe any limitations of the proportion of carbon monoxide which might be supplied in gas used for domestic purposes. The members of the Committee were men well qualified to deal with the matter submitted to them. Sir William Pearce, M.P., was Chairman, and the other members of the Committee were Dr. Thomas Carnwath, D.S.O., M.B., Mr. William Doig Gibb, O.B.E., M.Inst.C.E., and Dr. Thomas Gray, D.Sc., Ph.D.

At the outset of the inquiry, the Committee's attention was drawn to the report of an earlier Departmental Committee (known as the Water Gas Committee) appointed by the Home Office in 1898, to inquire into the manufacture and use of water gas, and other gases containing a large proportion of carbon monoxide. Among their recommendations, the earlier Committee suggested "that power should be conferred upon a Central Department to make regulations, enforceable by adequate penalties, limiting the proportion of carbon monoxide in the public gas supply at night to 12 p.ct., or such greater

amount as the Department may consider desirable." No legislative action was, however, taken on this recommendation. The 1921 Committee pointed out the changes in connection with the manufacture and consumption of gas that had been brought about in the intervening period, and said that they had been fortunate in obtaining evidence from Dr. J. S. Haldane, F.R.S., who, as a member of the Water Gas Committee, made certain experiments in 1898, which no doubt greatly influenced that Committee in suggesting a maximum of 12 p.ct. of carbon monoxide in gas supplied at night.

In his evidence before the later Committee, Dr. Haldane said that he was still inclined to think it wise to specify a definite maximum percentage of carbon monoxide in lighting gas for domestic use; but, in view of the improved forms of gas burners, which passed much less gas in a given time than those which were commonly used in 1898, he thought a reasonable maximum would probably be about 20 p.ct. This would allow 33 p.ct. of blue water gas or about 50 p.ct. of carburetted water gas to be mixed with coal gas. The representatives of the gas industry who came before the 1921 Committee asked that no statutory limitation should be imposed, though it appeared that at that time few undertakings would be inconvenienced by a limit of 20 p.ct., except in cases of emergency. The Committee commented upon the remarkable improvement in the atmospheric conditions of London at the time of their report, when the Metropolis was "under the extraordinary circumstances of a great coal dispute," and added that in these abnormal conditions the Board of Trade had been obliged to issue an order to every gas undertaking possessing means of making water gas to use that power to the fullest possible extent.

After weighing very carefully all the facts concerned, the Committee concluded, on the balance of advantage to the public, that they were justified in recommending non-limitation of the proportion of carbon monoxide which might be supplied in gas used for domestic purposes. In coming to this conclusion, they stated that they had not ignored the increased risk from the poisonous nature of carbon monoxide; but, when all practicable precautions were adopted, they did not consider that the increased risk would be found a serious one. The danger of increased death rate was in any case small, and against this must be set the certain improvement in the public health by the reduction of smoke and fog arising from increased use of gas. The Committee were satisfied of the economic advantages which at that time followed the use of water gas, and were greatly impressed by the necessity of allowing the development of the gas industry to proceed without any check on its natural progress. They did suggest, however, as already remarked, that the Departments concerned should carefully watch the situation, so that, if the freedom from limitation which was then recommended was accompanied by unexpectedly unfavourable results, the attention of Parliament might, if necessary, be again directed to the matter. Viewing all the circumstances, specially bearing in mind the growth in the consumption of gas since 1921, it does not seem to us that the non-limitation recommendation of the Pearce Committee has been attended by "unexpectedly unfavourable results;" while "the necessity of allowing the development of the gas industry to proceed without any check on its natural progress" is certainly at least as great now as it was eight years ago.

## Flexibility in Low-Temperature Carbonization.

It has been discovered by Mr. E. V. Evans and Mr. H. Stanier, of the South Metropolitan Gas Company, that when the hydrocarbon vapours which are produced in the low-temperature carbonization of coal are heated in the presence of hydrogen before they have had time to condense, there is a greater yield of gaseous therms than is obtained from the re-volatilized hydrocarbons of the same thermal value; and this finding has resulted in their taking out, in conjunction with the South Metropolitan Gas Company, a patent for "Improvements in the Manufacture of Coal Gas," an abstract of which appears in later columns of this issue.

There are three methods in which it is proposed that their system should be applied. The first consists in carbonizing the coal in an externally heated retort at a temperature of about 600° C., and admitting water gas (produced in a separate generator) to the base of the retort. The admixed gases are led into a cracking chamber heated to 700°-800° C., and thence pass to the normal condensing and purifying plant. Naturally the volumetric yield and the calorific value of the resulting gas will depend on the quantity of water gas used. As an example, however, it may be stated that, if 7000-8000 c.ft. of water gas is added per ton of coal carbonized, and if the coal treated in the ordinary way in horizontal retorts would yield between 70 and 73 therms of "straight" gas of a calorific value of 560 B.Th.U., then about 75 to 80 therms of 560 B.Th.U. gas would result. The coke obtained is, of course, a low-temperature product, and the tar condensed is approximately the same as that obtained in normal high-temperature processes of carbonization. The second method of applying the idea is to admix a hydrogen-rich water gas (if desired, freed from carbon dioxide) produced in a generator worked at comparatively low temperature; and a third modification lies in passing into the retort a mixture of water gas and gas made from the high-temperature carbonization (with or without steaming) of the low-temperature coke.

If the proposed new process should prove commercially successful, it would add to low-temperature carbonization the virtue of flexibility; for a plant working on the method outlined would be able to satisfy the demand for a readily-ignitable coke without very great reduction in gas yield compared with the high-temperature process, and at the same time the tar produced would at the present time find a more remunerative market. Moreover, operating conditions could be varied at will to follow the trend of local demand and the market prices of residual products.

## Mobile Showrooms.

Fortunately there is now less need to emphasize the necessity for all gas undertakings to concentrate considerable attention on showroom publicity not only from the aspect of establishment of adequate and attractive premises, but also from that of their efficient staffing and proper maintenance. All are agreed that expenditure in this direction is wise; and at the present time there must be very few concerns that are not possessed of permanent showrooms where consumers may see gas appliances in favourable surroundings and in actual operation. The success which has attended efficient showroom organization, however, has paved the way to new enterprise. Undertakings which serve a scattered area have discovered that many of those living in the outskirts seldom, or never, visit the central showrooms, and consequently fail to appreciate to the full how enormously gas can help them in their daily lives, and how economical and labour-saving this service is.

Whether or not the York Gas Company and their Engineer, Manager, and Secretary, Mr. H. E. Bloor, were the first to appreciate that actual demonstration must be coupled to Press advertising if the average consumption per consumer in the outlying districts is to be what it should be, to Mr. Bloor certainly belongs the credit of being the pioneer in the matter of mobile showrooms in this country. Just over a year ago we published an illustrated description (in the "Gas Salesman" for March 28, 1928) of the York Gas Company's original venture; and Mr. Bloor's paper before the British Commercial Gas Association last October bore witness to the success which had attended it not only in the remote parts of the Company's district, but also in places within a short distance of the centre of the City of York.

Since then it has been announced in our columns that the Bradford Corporation Gas Committee intend to build a travelling showroom on similar lines to that of the York Gas Company; and in our issue to-day we publish an illustrated description of the mobile showroom of the Rochdale Gas Department, to whom, we believe, belongs the palm of being second in this field of enterprise. Mr. H. Shewring, the Gas Engineer and Manager at Rochdale, and his Committee will doubtless quickly feel the benefit, both direct and indirect, of affording their consumers in outside districts the convenient opportunity of

inspecting for themselves the latest gas appliances. It will be seen from the photographs that the showroom, which is certain to arouse great interest wherever it is taken, is of ingenious construction and has been most attractively equipped and furnished.

## Co-Partnership in the Gas Industry.

For many years past the gas industry has prided itself on its profit-sharing and co-partnership schemes; and it is a pleasure to note, in so large a proportion of the Private Bills promoted, the inclusion of clauses giving authority for the establishment of this system by the promoting undertakings. These clauses are of value as evidence of belief in the soundness of the principle; and, of course, little trouble is involved in adding them to any Bill which it is necessary to place before Parliament for the sanctioning of other powers. But it might be wished to establish a scheme at a time when there was no need to go to Parliament for any other purpose. This consideration lends interest to the suggestion in the report of the Committee on Industry and Trade (which sat under the Chairmanship of Sir Arthur Balfour) that a measure which "would in effect confer upon statutory undertakings or limited companies the right to introduce profit-sharing schemes if they so desire without further authority from Parliament or any Court," would remove a possible impediment to the free development of enterprise and to varied experiment in the field of industrial relations.

The removal of such an impediment is sufficient justification for the proposal to this end which has already been embodied in a Private Member's Bill. It is to be hoped, therefore, that, when matters parliamentary are less pressing, opportunity may be taken to place a measure of this character, with which no one would have just cause of quarrel, upon the Statute Book; for it is common knowledge that in our own industry co-partnership has been productive of much good, and will be productive of much more. The Balfour Committee themselves describe the gas companies as constituting "perhaps the most remarkable example" of the successful operation of schemes of this character; and it is undeniable that, "with their stable demand and practically certain profits," they present an obviously favourable field for an experiment of this nature. Hence there would seem to be plenty of scope in the industry for the further development of this effective means of improving the relations of employers and employed.

But, with the Balfour Committee, we should like such an Act as has been referred to above to be permissive, and not compulsory. We agree with the Committee in deprecating any suggestion that statutory or other companies should be compelled or induced by some kind of differential treatment to adopt schemes of this kind. In the success attained by schemes introduced by voluntary agreement the Committee find no warrant for an attempt by the State to force them on unwilling undertakings; nor can they imagine any course more likely to conduce to their failure. The Committee were, however, only indirectly concerned with what happens in the gas industry. Their task was to inquire into the conditions and prospects of British industry and commerce, with special reference to the export trade; and they are not satisfied that the experience of the gas companies' schemes throws much light on the possibilities of profit-sharing in its general application to the great exporting industries, exposed as they are to the full blast of foreign competition, and liable to wide fluctuations of prosperity. They see little immediate prospect of the development of profit-sharing in these industries on a scale which would make any very substantial contribution to the solution of the problem with which they are concerned.

### William Murdoch.

It has been suggested by correspondents in our contemporary "Engineering" that some co-ordinated effort should be made to rescue from comparative oblivion the name and achievements of that great engineering genius William Murdoch. The letters are published in full in this issue of the "Journal," and will be of interest to all connected with the gas industry. Murdoch's fertile imagination, however, was by no means confined to what may be termed gas inventions; and consequently the appeal should meet with general sympathy from all ranks of the engineering profession. Our correspondence columns are open to our readers, whom we invite to express their views on the matter.

### Making Good Roads.

In a paper on "Road Tar" read before the Midland Section of the Coke Oven Managers' Association last Wednesday, Mr. W. E. Cone, the Technical Adviser to the British Road Tar Association, suggested that, if road tar is to take its rightful place in the national highway schemes of the country, still further improvement is necessary. There is, he said, an insistent need for further experiment and research in the selection and blending of tars so that, as the essential characteristics of road tars become more widely realized, we may advance our methods of preparation, and raise the standard accordingly. The combination of pitch and heavy and middle oils to give the required properties of adhesiveness, penetration, and durability under traffic and weather conditions necessitates careful proportioning. At a time when the preparation of road materials becomes more and more the province of the scientist and chemist, it is a matter of urgent importance to the tar industry to adopt perfected methods of control over the quality of the tar obtained. It is only by careful co-operation between the various authorities on the subject that a correct appreciation of the problems involved can be arrived at, and the way to further advances prepared.

### A Go-Ahead Concern.

The Romford Gas Company is known to us and to many of our readers as a good example of the medium-sized go-ahead gas undertaking which presents modern weapons to the frontal attack of a strong competitor. Further evidence of this was provided at the recent half-yearly meeting of the Company, when the Chairman, Mr. Bevous Smith, was able to announce that gas sales for 1928 showed an increase of 9·99 p.ct. over the previous year. There had been more than 1400 consumers added to the roll, and a heavy increase in the appliances on the district. Having recently read these facts, we were pleased, on a recent journey, to find confirmation of the Company's belief in publicity. From Romford Station may be viewed a large white poster at a splendid corner site in the town; and it bears the legend "Site for New Showrooms of the Romford Gas Company."

### Base Metal Prices.

It is recognized that the costs of some raw material for a long time past have been on an unremunerative basis for the producers. We have only to look at our iron and steel trades, the basis of which, of course, is pig iron. For some time, producers of pig iron have been trying rightly to sell their products on a remunerative basis, and accordingly their price has been steadily rising—and will no doubt continue to do so. Costs of copper, spelter, and lead go on showing substantial increases; and only recently a notice has gone out from the brassfounders that all prices will be raised 10 p.ct.

### Long-Distance Gas Transmission in Germany.

On later pages of our issue to-day will be found an extract from a paper on "Long-Distance Transmission of Coke Oven Gas in Germany" by Dr. Alfred Pott, of Essen, before the Second International Conference on Bituminous Coal held in Pittsburgh last November. The author deals with several important facets of the subject, including optimum pressures and pipe diameters, and the type of pipeline it is desirable to employ. Regarding the former, he states that it is uneconomical to compress the gas immediately to a very high initial pressure and have it available at an unnecessarily high pressure within a distance of 60 to 70 kilometres. Also, the liability of underground earth movements in the Rhenish Westphalian district renders low pressures desirable. As a result, an initial line pressure of from 45 to 90 lbs. per sq. in. was decided upon.

He emphasizes that this solution cannot be generalized. Everything depends upon particular conditions; and this year a line 200 kilometres in length is to be laid where the gas is at once compressed to 175 lbs. per sq. in. Though higher pressures entail greater deposition of naphthalene from the gas, yet it has been found in practice that with such pressures troubles of this nature occur much less frequently than at lower pressures; the point being that above certain pressures the precipitation of the naphthalene takes place in solution in oil, and can be removed from the pipeline without difficulty through the water seals. The best remedy, however, lies in the complete removal of the naphthalene from the gas at the place of manufacture. The author suggests that the problem of pipeline construction, even for the highest pressures, may to-day be considered as completely solved. The material most suitable for high-pressure lines is steel having a tensile strength of 38,000 to 58,000 lbs. per sq. in. and an elongation of more than 5 p.ct. The use of a harder steel, he observes, is generally inadvisable in view of the imperfections of the welding seam. Dr. Pott's description of the method of laying the pipelines is of extreme interest, as also is his review of progress made and of developments contemplated.

## OBITUARY.

### CHARLES HUNT.

It is with the deepest regret that we have to record the death, on March 30, at Kelvin Grove, Rectory Road, Beckenham, of Mr. Charles Hunt, in his 87th year.

For half-a-century and more the name of Hunt has been a household word in the gas industry, mainly, of course, in connection with the Birmingham Corporation gas undertaking. Mr. Hunt entered the gas industry as a pupil at the Great Yarmouth Gas Company, where he remained five years, at the end of which time he went into the drawing office of Messrs. Parkinson & Co. He became Assistant, first under the late Mr. David Watson, and then under the late Mr. Robert Morton, at the Nine Elms Works of the London Gas Company, in whose service he was from 1866 to 1872. At the time he was appointed to the position, he was under 24 years of age.

#### At Birmingham.

It was in the year last mentioned that Mr. Hunt was selected for the Chief Engineership of the late Birmingham Gas Light Company. He succeeded at Birmingham Mr. Edward White, who had resigned. In the year that he entered upon his work at Windsor Street—where he remained as Engineer until he retired in 1902—the whole of the authorized share capital of the Company had been called up, and in 1874 a Bill was promoted in Parliament. In the meantime, the Company had settled upon a site for new gas-works at Nechells and Duddeston; and that large works were subsequently erected there was a tribute to the soundness of Mr. Hunt's judgment and to his foresight so many years before. The Bill then promoted was what really brought about the transfer of the gas undertakings to the Corporation. Mr. Joseph Chamberlain was at the time Mayor of Birmingham, and the suggestion was made to him that the moment was opportune for the purchasing of the gas undertakings. This was done, and from that time on the history of the great Birmingham Corporation Gas Department has been one of continued progress. Before the acquisition of the Companies' undertakings by the Corporation Mr. Hunt had already proved himself a man of strong will, of firm hand, and of keen penetration. By his work he had gained the confidence and appreciation of his Directors, who, in their report on the operations of the Company during the second half of 1874, recorded "their high appreciation of the skill and energy displayed by the Chief Engineer, Mr. Charles Hunt, to whose untiring exertions and sound judgment the present improved condition of the Company's affairs is largely due." With the transfer of the works, the Engineers of the two Companies went into the service of the Corporation, and then commenced the dual engineership on those lines of which Birmingham for so long remained a solitary example in this country. Mr. Henry Hack was the Engineer to the second Company concerned—the Staffordshire Company—and he continued at Saltley for many years.

As the works were purchased by the Corporation in 1875, Mr. Hunt spent of the 30 years he was at Windsor Street some 27 years in their service. In the early eighties the works were entirely rebuilt from his plans and specifications; and a full illustrated account of what he did appeared subsequently in the pages of the "Journal."

#### His Retirement.

The time for Mr. Hunt's retirement from his position at Birmingham arrived in 1902; and at the end of August in that year there was a very large gathering of the officers, staff, and workmen of the Windsor Street and Adderley Street Gas-Works, on the occasion of the leave taking; the chair being occupied by Mr. Thomas Bradbear, who had been foreman of the Meter Department since 1876. The occasion, the Chairman remarked, was one of deep regret combined with pleasure—regret at parting with one with whom they had been so intimately connected for a great number of years, and pleasure to see the splendid condition he was in to continue his work. He thought all would agree with him that there was plenty of work still left in Mr. Hunt. There followed a presentation consisting of an address richly illuminated, and enclosed in a solid gilt frame. It read as follows:

We, the Officers, Clerical Staff, and Workmen, at the Windsor Street and Adderley Works of the City of Birmingham Gas Department, beg to offer you our good wishes on your retirement from the responsible office of Engineer, after a lengthy and honourable service of thirty years.

It is difficult, after having enjoyed an unbroken connection of so long duration, to express adequately in words how deeply we feel the severance, especially when we remember your uniform kindness and courtesy, and the impartiality with which you have invariably discharged your numerous duties—a no light task with such a large number of men, and so many varying occupations under your charge.

While we regret your departure from among us, we each and all desire to mark our appreciation and regard of your kindly feeling and goodwill, and respectfully ask your acceptance of the accompanying silver rose bowl as a small token of the friendly relations which have existed between its superior officer and all grades of the works staff.

In conclusion, we respectfully tender to you our unfeigned desire that you may be blessed with a continuance of good health; and we heartily wish you God-speed and happiness throughout increasing years.

#### In London.

The correctness of the opinion that Mr. Hunt had still many years of hard work before him was abundantly proved; for on leaving Birmingham he opened offices in Victoria Street, Westminster, where he commenced practice as a Consulting Gas Engineer. Having had extensive practice as a parliamentary expert, valuer, arbitrator, &c., his advice was much sought after, and he found much work in connection with the promotion of Bills in Parliament, preparing valuations of gas undertakings for their acquisition by municipal authorities, and as valuer and expert witness in appeals against rating assessments. He joined the Boards of several Gas Companies, and so long as his health permitted took an active part in their administration. On the death of Sir George Livesey, Mr. Robert Morton was chosen as his successor as Chairman of the South Suburban Gas Company. But he relinquished the position; and in March, 1909, Mr. Hunt was elected to fill it. Under his Chairmanship, the Bromley and West Kent Gas Companies were amalgamated with the South Suburban Gas Company, and the Dartford Gas Company also became part of it. Mr. Hunt was also at one time on the Boards of the Bombay Gas Company, Bude Gas Company (Chairman), Ceará Tramway, Light, and Power Company (Chairman), Colonial Gas Association (London Board), Llandrindod Wells Gas Company (Chairman), and Monte Video Gas Company (Chairman).

In 1870 Mr. Hunt became a member of the British Association of Gas Managers, and was President in 1880-1 on the occasion of the meeting in Birmingham. He suggested the Birmingham Medal to the Midland Association of Gas Managers, of which he was the founder; and the proposition was brought before the larger Association at their meeting in 1881. It was approved of, and the first presentation was made the following year to Sir George Livesey. Mr. Hunt was a member of the Finance Committee of the Association, and he was instrumental in having the name changed to the Gas Institute. He left the Institute in 1889 to join the first Institution of Gas Engineers, and was soon placed upon the Council. He was President in 1892. On the amalgamation of the Institute and the Institution, Mr. Hunt passed into the new body, and was President in 1907. He was made an honorary member of the Institution of Gas Engineers and of the Midland Association. The Birmingham Medal was awarded him in 1886. He was the first President of the Midland Association, in 1877, and in 1902 the members again elected him to that office. In 1908 he was elected Trustee of the Benevolent Fund of the Institution of Gas Engineers.

To all these bodies Mr. Hunt proved of inestimable value; for, in addition to his various Presidential Addresses, he contributed a large number of papers, dealing with subjects of the greatest importance to the industry with which his life's work was identified. He was also at one time a frequent correspondent to the pages of the "Journal." Many have had to thank Mr. Hunt for the helping hand he extended to them in their early careers.

Besides all this, Mr. Hunt has left a monument to his ability and knowledge of the manufacture and supply of gas in Groves

and Thorpe's "Chemical Technology," Vol. III. of which, on the subject of "Gas Lighting," was entirely his work. Another work of his was "A History of the Introduction of Gas Lighting," which was published at the "JOURNAL" Office in 1907, and contained a wealth of information and illustrations. In 1888 Mr. Hunt and Mr. Thomas Newbigging consented to act as co-examiners with Mr. Robert Morton in the City and Guilds of London Institute examinations in "Gas Manufacture." He was admitted to membership of the Institution of Civil Engineers in 1881, to which he contributed a paper on "The Construction of Gas-Works" in 1894. More than twenty years ago we described in the "JOURNAL" the gas-works of the first Garden City (at Letchworth), to which Mr. Hunt acted as Consulting Gas Engineer. He also acted as representative in England of the Dessau Vertical Retort Company.

Mr. Hunt is survived by two daughters (one married) and three sons. Of the latter, two are connected with the gas industry Mr. Philip C. Holmes Hunt is a Consulting Gas Engineer resident in Melbourne, Australia, and is Chairman and Managing Director of the Colonial Gas Association. Mr. Clifford Holmes Hunt, who is in practice as a solicitor at 17, Victoria Street, Westminster, is a Director of the Biggleswade Gas Company, and is also on the London Board of the Colonial Gas Association.

To the bereaved relatives our heartiest sympathy is offered. The funeral is to-day, at Shirley Church, near Croydon.

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The death occurred on March 30 of Lord MONTAGU OF BEAULIEU, who, as our readers are aware, was an authority on roads and transport problems. His Roads Protection Bill was discussed in our columns by Mr. R. W. Edwards, Chairman and Managing Director of the Aldershot Gas, Water, and District Lighting Company, on Oct. 31 last.

The death is announced of Mr. BENJAMIN FARMER, of Shifnal, at the age of 88. He was formerly Secretary to the Shifnal Gas Company, Ltd.

## PERSONAL.

Mr. H. D. MADDEN, M.Inst.C.E., the Engineer and Manager of the Cardiff Gas Company, has been appointed to serve as a member of the Fuel Research Board for three years.

Mr. H. C. DUNBAR, Assistant Manager, Hemel Hempsted District Gas Company, has been appointed Manager in succession to the late Mr. W. Fendick.

Lieut.-Col. J. KENNINGTON, D.S.O., M.C., has been appointed Manager to the Great Grimsby Gas Company.

Mr. W. H. THOMAS (Gas-Works Manager at Alcester) was returned at the head of the poll in the recent Alcester Rural District Council election.

Mr. WALTER T. DUNN, M.I.Mech.E., F.C.I.S., formerly Secretary of the Institution of Gas Engineers, has been adopted as the prospective Liberal Candidate for Hastings, the sitting member of which is Lord Eustace Percy, President of the Board of Education.

## ON THE ELECTRICAL SIDE.

### Further Blessings in Store.

Changing conditions which are bringing other nations into prominence as producers of manufactured goods have for some time past been giving rise to speculation as to how best the attention of people in this country can once again be turned from the industrial centres to the country; but hitherto the problem has seemed a difficult one. Better wages can be earned and more congenial conditions can be enjoyed in the towns than in the country; and the industrial worker finds pleasures at his hand which are denied to the rural population. How then, until economic conditions will no longer brook denial, is the cry of "Back to the land" to become anything more than a cry? Lieut.-Col. Wilfrid Ashley (Minister of Transport) supplies the answer. The "trinity of cheap power, wireless, and omnibuses" is to make the countryside as populated—we wonder if this also means "as popular"—as it was in the eighteenth century, and "thereby give that stability to the country which a contented rural population always gives." It was during a luncheon at the Forum Club that Col. Ashley offered this solution of one of the country's great difficulties. He said that, taking public and private installations together, it was estimated that the consumption of electricity per head of the population in Great Britain was 300 units, compared with 800 units in Switzerland, and 1200 units in the Chicago area. This was mainly because for many years Great Britain had had a very highly developed industry, and these other areas had not. Another reason was the restriction to extremely limited areas that had been imposed originally upon the producing authorities. There were now 438 public generating stations in this country; but the working of the 1926 Act would have the effect ultimately of reducing the number to 80 super-stations, inter-connected and with standardized current. He was confident that there would be a cheaper and better supply under the Act. When the consumption reached 500 units per head, the average price would be not more than 1d. per unit. Of that he was now as confident as when the Act was passed.

The consumption per head of the population has a long way to go before the 1d. per unit stage is reached. The year 1940 was the date originally decided upon as likely to witness this consummation, but upon what grounds one cannot be quite sure. However, the Electrical Association of Women are trying to interest the women's institutes in rural electrification; and this may do something to speed-up the trek—by omnibus—from the town to the countryside.

### At the Ideal Home Exhibition.

With the excellence of the gas display at the recent Ideal Home Exhibition at Olympia readers of the "JOURNAL" have already been made acquainted, both by word and picture; but should further testimony be needed to the success of what was done, this is provided by our friends the electricians. A contemporary, referring to the houses to be seen in the village of "Welcome-in," said: "A large and rapidly increasing proportion of the public has convinced itself that homes without electrical service are hardly habitable. It goes to Olympia to see the last word in home design and equipment, and finds as examples homes in which electricity is only conspicuous by its absence." We have our own views as to the proportion of the public who are perfectly satisfied to live in homes without electrical service; but that is by the way. What must be gratifying to those who organized the gas display at Olympia is the comment of a correspondent, who writes to our contemporary as follows: "Organizations in the gas industry managed to secure two out of the seven houses in which to 'demonstrate that gas, suitably applied, is unrivalled from all points of view for supplying light and all the heat required in a house.' One of the houses had a complete gas and coke service for lighting, heating, cooking, water heating, and refrigeration. Effects obtained by electrical means were closely imitated, as in the series of gas lighting fittings in which the burners are screened by tinted glass panels; and among other gas equipment seen in the villas were irons, clothes-drying cabinets, curling iron heaters, towel-rail heaters, coppers, smoker's companion, pilot lights, and night lights. In one of these 'gas' houses a feature is made of distant-controlled lighting. In the hall the light is controlled from the foot of the stairs, as well as from the door, so that the light may be switched on before entering the hall." It is true that the correspondent apologizes for "this gratuitous advertising of gas;" but he need not have done so, for the display was deserving of being singled out as a first-rate example of enterprise. With regard to imitation of effects obtained by electrical means, this is an advertisement to which the electricians, on their side, are certainly welcome. It is not, however, easily understandable how the screening of lights by tinted glass panels becomes an "effect obtained by electrical means."

### Two New Committees.

The Electricity Commissioners have appointed a Committee to consider what steps could be taken to ensure that facilities for assisted wiring and for the hire and (or) the hire-purchase of apparatus are made available, wherever needed, to prospective consumers of electricity in rural and other areas of supply, and to make proposals for a practical financial scheme for the purpose. Another Committee has been appointed to consider the charges and tariffs offered by authorized undertakers for electricity for lighting and power purposes, with a view to making definite proposals for greater uniformity in charges.

### Monthly Accounts.

The question of monthly accounts, which has lately been a somewhat prominent one in the gas industry, is also attracting attention outside, as the following paragraph from the "Electrician" shows: "Although there are certain obvious difficulties in the way of introducing a system of monthly payments for electricity bought from electricity supply undertakings, the advantages of such a method over quarterly payments are so great that the matter would seem to merit more careful consideration than it has yet secured. The psychological factor involved is an important one. At any time of the year most people find it less difficult to find money to pay monthly ac-

counts than those made up every three months; and when there are severe spells of cold weather, involving a greatly increased consumption of electricity, it is obviously desirable that consumers should pay for their abnormal requirements while the memory of the service rendered is still fresh in the mind. A system of monthly accounting would secure this end, and would bring electricity supply into what Mr. H. W. Roberts has termed the housekeeping budget. Under such a system, a substantial proportion of the extra trouble involved in the monthly reading of meters could be avoided by the use of outdoor meters."

**Lamp Price Reductions.**

An announcement by the Electric Lamp Manufacturers' Association of a forthcoming reduction in the prices of certain types of lamps will, it is anticipated, "lead to the ultimate suppression, except for special purposes, of lamps in clear glass bulbs." In the case of several types of lamps commonly used the reduction brings the cost of those in which the bulb is frosted below that of similar lamps in clear glass bulbs. A 100-watt frosted lamp, for example, in the standard voltages, will cost 3s. 6d., or 6d. less than the same size in transparent glass bulb. In order to assist in the general simplification and standardization of the many pressures at which current is available, lamps which conform to the standard of 230 volts adopted by the Electricity Commissioners for lighting purposes will cost 1d. less than those made for other pressures.

## GAS STOCK AND SHARE MARKET.

**[For Stock and Share List, see later page.]**

The improved monetary conditions had a brightening influence on the Stock Exchange last week. The news from New York of the wholesale deflation in prices was somewhat disturbing, but so far the reaction has had little or no effect in this country. Gilt-edged securities were encouraged by the hope of substantial additions to the Bank's gold stock in the immediate future; and even Home Rails, stimulated by recent traffic improvements, threw off their depression. Dealings in the Industrial Market were not characterized by much activity, for which doubtless the holiday atmosphere was responsible.

Business in the Gas Market, despite the approaching holiday, was good, and prices were well maintained. The European £10 shares and Imperial Continental stock recorded a large number of transactions, and any stock coming into the market was speedily absorbed. The former recovered the ½ point lost the previous week, while the latter was marked up 10 points to 385-405. It will be noticed in the Stock and Share List that Continental Union ordinary, Primitiva shares, and South Metropolitan ordinary declined slightly.

The following transactions were recorded during the week:

Monday.—Alliance and Dublin 99¼, 100¾, Bournemouth 6 p.ct pref. £11 1s. 9d., British 5 p.ct. deb. 95, European 18, 18⅛, 18⅜, 18⅜, 18½, 19, Gas Light and Coke 18s. 10½d., 19s., 19s. 1½d., 19s. 2¼d., 4 p.ct. pref. 76, 3 p.ct. deb. 60, 5 p.ct. deb. 101¼, Hastings and St. Leonards 5 p.ct. 100, Imperial Continental 371, 372, 372½, 375, 376, 378, 380, Newcastle 3½ p.ct. 17s. 3d., Primitiva 30s. 10½d., 31s., 31s. 3d., 31s. 7½d., 31s. 9d., South Metropolitan 106¼, 6 p.ct. pref. 109¼, Swansea 101, Tottenham 3½ p.ct. 102½, Wandsworth new 104, 105, 105½. Supplementary prices, Bournemouth 7 p.ct. deb. 103, Cambridge University 156½, "B" 112, Danish 7¾, South Suburban 7 p.ct. deb. 99½, Tottenham 5 p.ct. pref. 89, Yorktown and District new 5 p.ct. pref. 92.

Tuesday.—European 17¾, 18, 18⅛, 18¼, Gas Light and Coke 18s. 10½d., 19s., 19s. 1½d., 4 p.ct. pref. 76, 76½, 3 p.ct. deb. 58¾, 5 p.ct. deb. 101¼, Imperial Continental 375, 376, 378, 380, 382, 383, 387, Primitiva 30s. 9d., 31s. 3d., South Metropolitan 105½, 106, 106½, Wandsworth, Epsom Stock, 129. Supplementary prices, Eastbourne "B" 105, Southgate 7 p.ct. max. 111.

Wednesday.—Alliance and Dublin 99½, Bournemouth 6 p.ct. pref. 11 1/16, British 5 p.ct. deb. 95, Commercial 98, 3 p.ct. deb. 56½, Continental Union 122, 122½, European 18, 18¼, 18½, 19, 19¼, Gas Light and Coke 18s. 10½d., 18s. 11¼d., 19s., 19s. 1½d., 3½ p.ct. 64, 4 p.ct. pref. 75¼, 76, 77½, 3 p.ct. deb. 58, 58⅛, 59⅜, 5 p.ct. deb. 101¼, Imperial Continental 380, 383, 384, 385, 387, 390, 392, Montevideo 107, Primitiva 30s., 30s. 6d., 30s. 7½d., 30s. 9d., 31s., South African 5, South Metropolitan 106 1/16, 6 p.ct. pref. 109⅛, South Suburban 5 p.ct. deb. 99, 99½, Southampton 5 p.ct. 77, 78, 4 p.ct. deb. 73, Wandsworth 3½ p.ct. "B" 128½, Wimbledon 5 p.ct. 118. Supplementary prices, Liverpool 5 p.ct. 94½, North Middlesex 6 p.ct. pref. 107½, 108, Torquay and Paignton 5 p.ct. pref. 82.

Thursday.—Continental Union 120½, 121, 122½, 123, 7 p.ct. pref. 124½, 126½, 127, European 19⅝, 19¾, 20, 20½, 20 1/16, Gas Light and Coke 18s. 9¾d., 18s. 10½d., 19s., 19s. 1½d., 4 p.ct. pref. 76, 5 p.ct. deb. 99, 101¼, Imperial Continental 388, 390, 391, 392, 393, 394, 395, 396, 398, 399, Oriental 118, Primitiva 30s. 3d., 30s. 4½d., 30s. 7½d., 31s., South Metropolitan 6 p.ct. pref. 109, Tottenham 3½ p.ct. 102½, 103½, 104½, Wandsworth "B" 129, Wimbledon 5 p.ct. 119. Supplementary prices, Croydon 4 p.ct. deb. 78, Eastbourne "B" 103, 103½.

Silver was easier on Chinese sales at 25 1/16d. per oz., and Gold remained at 84s. 11½d. per oz.

The Bank Rate is 5½ p.ct., to which it was raised from 4½ p.ct. on Feb. 7. The Banks' deposit rate is 3½ p.ct., and the deposit rates of the Discount Houses are 3½ p.ct. and 3¾ p.ct.

## FORTHCOMING ENGAGEMENTS.

**April 6.**—Scottish Junior Gas Association (Western District).—Annual General Meeting and closing address by Mr. C. S. Shapley, at the Royal Technical College, Glasgow.

**April 6.**—Western Junior Gas Association.—Annual General Meeting. Presidential Address.

**April 6.**—Midland Junior Gas Association.—Visit to the Saltley Works of the Birmingham Tame and Rea Drainage Board.

**April 12.**—North British Association of Gas Managers.—Spring Meeting in the Town Hall, Alloa. Presidential address of Mr. J. W. Napier.

**April 13.**—Wales and Monmouthshire Junior Gas Association.—Annual General Meeting at Newport.

**April 13.**—Manchester and District Junior Gas Association.—Annual Dinner and Social. Paper by Mr. S. L. Wright, Colne, on "Hydraulic Mains—Theory and Practice."

**April 13.**—Scottish Junior Gas Association (Eastern District).—Meeting and visit to Galashiels Gas-Works.

**April 13.**—London and Southern District Junior Gas Association.—Visit to Works of Lea Bridge District Gas Company.

**April 17.**—British Commercial Gas Association.—Meeting of the Executive Committee in London.

**April 17.**—British Commercial Gas Association.—Annual Meeting of the South-Western District at Exeter at 3.30 p.m.

**April 17.**—Southern Association of Gas Engineers and Managers (Eastern District).—County Meeting at the Old Ship Hotel, Brighton, at 12.30 p.m.

**April 18.**—Midland Junior Gas Association.—Meeting at Birmingham. Paper by Mr. F. J. Bengough on "Heat Control on Continuous Vertical Retorts."

**April 20.**—Scottish Junior Gas Association (Western District).—Visit to Motherwell and Wishaw Gas-Works.

**April 20.**—Yorkshire Junior Gas Association.—Meeting at Sheffield. Visit to the Orgreave Coke Oven Plant.

**April 25.**—British Commercial Gas Association.—Midlands District Conference at Cheltenham.

**April 30.**—Society of British Gas Industries.—Annual General Meeting at the Hotel Metropole, Northumberland Avenue, W.C.

**May 1 and 2.**—Eastern Counties Gas Managers' Association.—Spring Meeting at the Hotel Cecil, London.

**May 2.**—British Commercial Gas Association.—Scottish District Conference at Aberdeen.

**May 8.**—British Commercial Gas Association.—Annual Meeting of the Eastern District at Peterborough at 3.30 p.m.

**May 10.**—British Commercial Gas Association.—Manchester District Conference at Southport.

**May 10.**—Southern Association of Gas Engineers and Managers.—Visit to Exmouth.

**May 16.**—Midland Association of Gas Engineers.—Visit to Shrewsbury.

**May 16.**—Wales and Monmouthshire District Institution of Gas Engineers and Managers.—Meeting at Cardiff.

**May 24.**—North of England Gas Managers' Association.—Annual Meeting.

**Sept. 12.**—North British Association of Gas Managers.—Annual Meeting at St. Andrews.

Institution of Gas Engineers.

**April 9.**—Gas Education Committee at the University of Leeds, 2.30 p.m.

**April 10.**—Executive Committee of Council, 11 a.m.; Finance Committee, 11.30 a.m.; Benevolent Fund Committee of Management, 12 noon.

# NEW SHOWROOMS AT GRIMSBY.

## Equipped by the Nautilus Company.

New showrooms of the Great Grimsby Gas Company, at the corner of Osborne Street and East St. Mary's Gate, Grimsby, have enhanced the appearance of the district. Substantial in construction, and impressive and pleasing to look upon, the building is a credit to the town and the Gas Company. Inside it is roomy, with all its appointments up-to-date from the business standpoint, and pleasant for the user. The main exhibition room, with its dignified oak panelling, is most attractive,

and one of which any business organization might well be proud. Over the main fireplace in this room is an artistic bronze tablet commemorating the opening of the building, which ceremony took place on Feb. 26.

Mr. W. BENNETT, J.P. (Chairman of the Company), who presided, welcomed the visitors. The Grimsby Gas Company, he said, was established in 1846. Their first works were in Victoria Street, then they moved to Eastgate, and finally to their present site in Sheepfold Street. Their works had been brought up-to-date in every respect as regards machinery and plant. They had been supplying gas for 83 years to a large part of the town, and they had taken gas eleven miles by road to Immingham, supplying the villages on the way. Recently they had taken gas to Laceby and Waltham, much to the pleasure and benefit of those two villages. They had their competitors. The electricity people were competing very strongly with them; but they had nothing to fear. Their business was increasing every week. Their policy was to be on good terms with their competitors; and so long as the competition was fair, they did not object to it. They had had a showroom for some years, but the Directors felt that it was not adequate. Hence the new building, which gave every facility for lectures, &c., on the use of gas equipment. They had appointed a special salesman with a wide experience, and a well-known cookery lecturer. They wanted their cus-

tomers to get the utmost value out of their gas, so they had arranged to teach them to use it without waste. Mr. Bennett paid a warm tribute to the Board of Directors. They were, he said, local business men who had made a success of their own businesses, so could make the business of the Gas Company a success. The heads of the various departments were capital men upon whom they could rely, and their staff was very satisfactory. Speaking of the building, Mr. Bennett said the credit for the design and the supervision of the work must go to a well-known local architect, Mr. H. C. Scaping, while the contractors, Messrs. Wilkinson & Houghton, had put the best possible work into the building.

### The Ancient Light.

Mrs. J. F. Wintringham, in declaring the showrooms open, said that it was a great honour to her to open this beautiful building. In these days of gloomy depression in trade it was a pleasure to

see that something was going ahead and flourishing. There were now nine million gas consumers. Practically every family used gas in some form or other where it was available. If they had had to suffer for twenty years with oil lamps, as she had, they would appreciate gas.

The Mayor (Mr. G. M. Smith) proposed, and Mr. John Barker seconded, a vote of thanks to Mrs. Wintringham. History was being made in Grimsby, said Mr. Barker, through the opening of a building of this magnitude. It would be most convenient, and he trusted that they were commencing an era of prosperity for the Company and for the town.

### Presentation to the Chairman.

Mr. W. H. Wintringham, J.P., on behalf of himself and his co-Directors, asked Mr. Bennett to accept an ornamental pencil. Both he and his co-Directors felt that the occasion should not go by without some recognition of Mr. Bennett's energy in the business of the Company.

Mr. Bennett returned thanks for the gift.

### The New Premises.

The new building occupies a site at the corner of Osborne Street and East St. Mary's Gate. The ground floor consists of spacious showrooms with corner entrance, meter inspectors' offices, covered yard, and entrance for vehicles from Osborne Street. The first floor comprises spacious general offices, cookery lecture room, display landing, and incidental accommodation.

The style adopted for the elevation is Georgian, with semi-circular arcading, giving large plate glass windows to the showrooms. The corner entrance is secured by wrought iron gates, as is also the side entrance to the offices. The entrance door itself is of a patent revolving type to prevent draughts. The materials employed are vitreous terra cotta dressings of Portland stone colour, and special red brick walling above. The roofs are covered with Westmoreland slates.

The showrooms have oak flooring, and are panelled out in Austrian oak to a height of about 8 ft., and terrazzo paving is used for the model bathroom and kitchen. The building is of fireproof construction throughout, is lighted by gas, and is centrally heated from a coke furnace. The heating can be supplemented by gas fires, and the main lighting units are controlled by switches.

The contractors for the building were Messrs. Wilkinson & Houghton, Ltd., Sidney Street; the interior fittings and oak work being by the Nautilus Company, of Luton. The central heating is by Messrs. Rosser & Russell, Ltd., of London and Leeds. The work has been carried out to the designs and under the superintendence of Mr. Herbert C. Scaping, Lic.R.I.B.A., of Grimsby.

## NOTES ON NEW BOOKS.

### MUNICIPAL YEAR BOOK, 1929.*

"The Municipal Year Book," founded in 1897 by Sir Robert Donald, G.B.E., LL.D., is produced with the co-operation of its Editor and the chief officials of all the local governing authorities and public departments—who assist in the revision of its contents each year. The issue for 1929 is of even greater value than its predecessors; its scope being widened by the inclusion of information with regard to the public utility services, of a kind which has not hitherto been brought together in one volume. For several years, by a series of tables, exclusive in character, and by the skilful presentation of statistics, the "Municipal Year Book" has shown the position of the municipal gas and electricity undertakings, tramways, light railways, motor omnibuses, water works, docks, and harbours. It has provided complete information as to their capital, revenue, expenditure, profits, charges, outgoings in rates, relief, &c. The new 1929 edition contains similar and complete information in regard to the undertakings of limited liability companies responsible for public utility supplies and services, and therefore performing public functions in intimate association with local authorities.

All the usual features which have made previous editions of the volume so valuable to the local government officer and the administrator are preserved. Thus the book summarizes the work of the municipal corporations, the county councils, and all other local governing bodies. The names and addresses of the councillors and officers of many hundred authorities are given. A series of tables of an exhaustive character reveals the present state of municipal trading and the multiform services which are undertaken by British, Scottish, and Irish local governing authorities. Lists of areas served by companies make a valuable new feature, while the volume contains a complete record of all the larger gas, electricity, and tramway companies. It also includes the only full list of water companies available in this country. Another new feature provides extensive information on hospital accommodation.

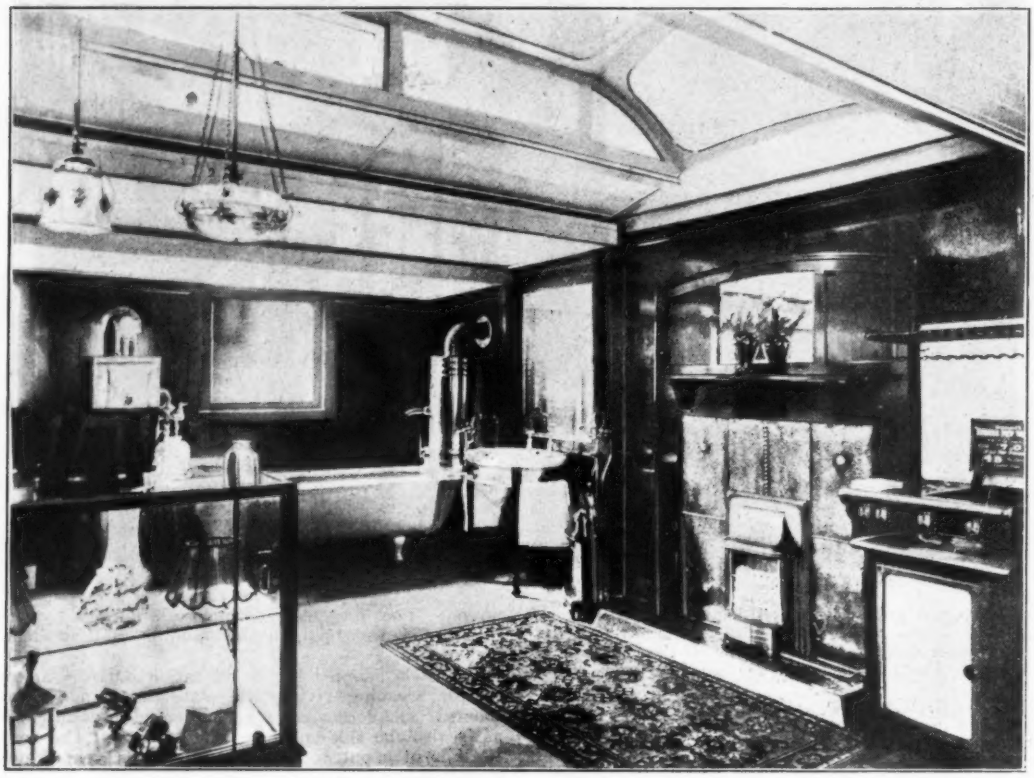
The review of new legislation, the summary of local government in 1928, and the presentation of important matter dealing with Mr. Chamberlain's Local Government Act complete the extensive information on local government.

* "The Municipal Year Book," 1929, edited by Edwin C. Fairchild; with a Preface by the Rt. Hon. Neville Chamberlain, M.P., Minister of Health, and a Foreword by Lieut.-Col. the Rt. Hon. Wilfrid Ashley, M.P., Minister of Transport. Price, 20s.; by post, 21s. The Municipal Journal, Ltd., Sardinia House, Sardinia Street, W.C. 2.

**Gas Consumption in America.**—According to the American Gas Association, Chicago consumes more gas than the combined consumption of Italy, Holland, Switzerland, Norway, Sweden, and Czechoslovakia. Baltimore's output exceeds Switzerland, Sweden, and Norway together; while Portland's (Oregon) equals Sweden's. New York sells more gas in an average quarter than all of Italy in a year.

# ROCHDALE'S TRAVELLING SHOWROOM.

## Catering for the Outside Districts.

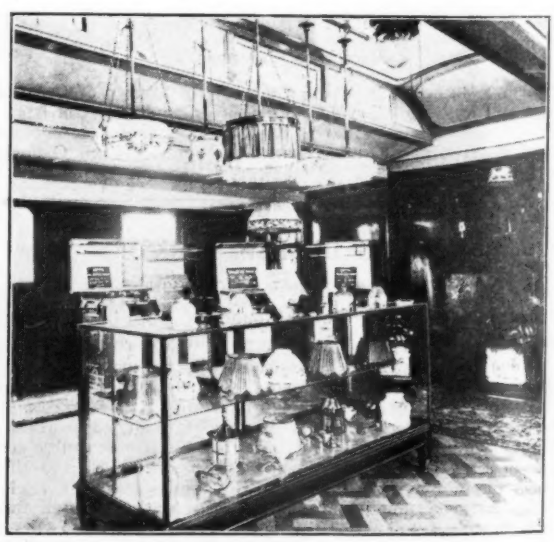


The latest enterprise of the Rochdale Corporation Gas Engineer and Manager (Mr. H. Shewring) and his Committee is the acquisition of a travelling gas showroom, which will give residents in the outside districts an opportunity of seeing the latest appliances.

The showroom is of most ingenious construction, and is sure to arouse great interest wherever it is taken. Reference to one of the accompanying photographs will show that the showroom, when erected, is divided into three sections, the central one

being distinguished by the projecting curved roof. When the showroom is on the road, the back and front portions are telescoped, so that the total width of the vehicle is that of the central section—or much the same as an ordinary furniture van. The vehicle is then towed to its destination, and is there extended by screwing out the front and back portions until the total size shown in the photograph is obtained. This gives a good sized room, interior views of which are shown.

It will be seen that the interior has been most attractively fitted up and furnished by Mr. Shewring so as to demonstrate a full range of modern gas appliances. In one corner is a bath and lavatory basin, with several types of geyser. At either end of the showroom there is a handsome fireplace fitted with a gas fire, and various types of stoves, cookers, refrigerators, and other appliances are exhibited.



It is intended to take the showroom out to the adjoining districts and to allow it to remain for some weeks in each, so that residents will have the latest developments of gas brought to their very doorsteps.

We are able to publish the photographs through the courtesy of the "Rochdale Observer."

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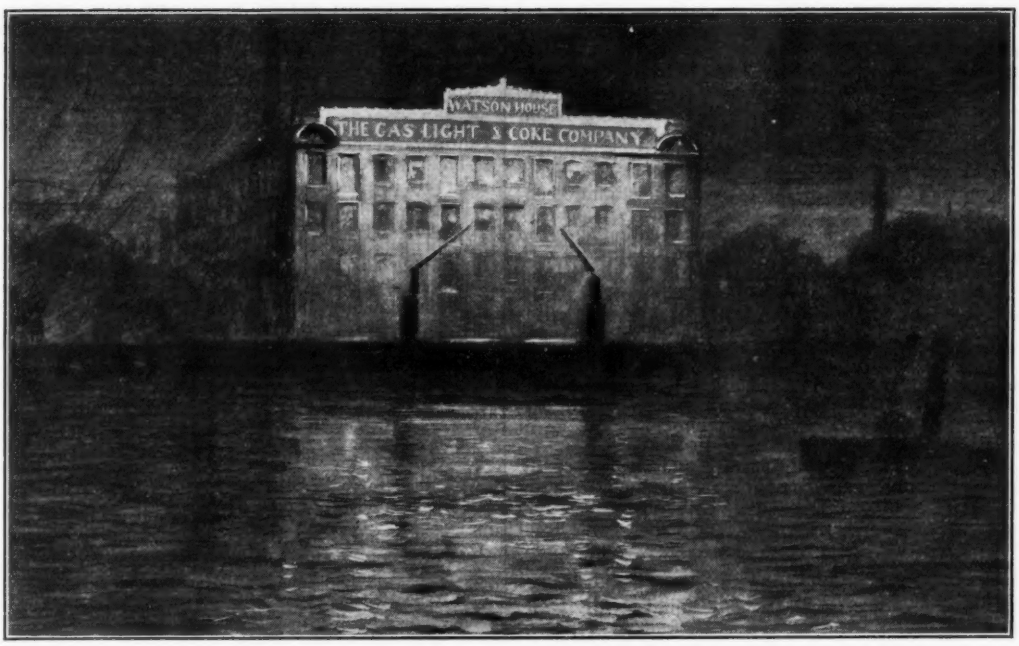
**The "A.G.A." Testing Laboratory.**—More than 11,000 different appliances, including ranges, space heaters, water heaters, and house heating units, have been inspected and approved by the Testing Laboratory of the American Gas Association. The appliances listed as safe include 9918 sizes and types of ranges, 920 space heaters, 316 water heaters, and 575 central house heating units. Specifications and requirements are now being prepared for testing gas hotplates and laundry stoves.

## WATSON HOUSE BY NIGHT.




**The above illustration, which we are able to publish through the courtesy of the Editor of the Gas Light and Coke Company's Co-Partners' Magazine, shows the riverside facia of Watson House illuminated at night. The facia is 110 ft. long, 7 ft. in height at the two ends, and 12 ft. in the middle.**

**The width of the river at this point is 750 ft., and the height from the water to the top of the facia 75 ft.**

**The facia is illuminated by eight 9-light and nineteen 7-light (No. 2 cluster mantles) Sugg "Rochester" lamps on distance controls; it being possible to light and extinguish the lamps individually, in groups, or all at the same time. To overcome the difficulties of maintenance, the lamps are fixed from horizontal arms which rotate about a double swivel, and are raised above the parapet and swung in through an angle of 90° by a wheel running on a rising guide rail.**

**The lamps collectively give approximately 20,000 c.p.**

## OBSERVATIONS ON AMERICAN GAS ENGINEERING PRACTICE.

By S. G. Watson, M.Sc. (Leeds), of Messrs. W. C. Holmes & Co., Ltd., London.

**[London and Southern District Junior Gas Association, March 22.]**

(*Continued from Vol.* 185, *p.* 862.)

### Ammonia Recovery.

The market for ammonia products in America is affected by the production of synthetic ammonia in much the same manner as in Europe. The smaller gas undertakings find the manufacture of sulphate of ammonia uneconomical owing to heavy overhead charges, the high cost of acid, and high labour rates. Ammonia liquor is therefore sold as such to larger gas undertakings or to chemical manufacturers—more frequently the latter, since the larger gas undertakings practise mainly direct recovery of ammonia as ammonium sulphate.

Concentrated ammonia liquor is also made, to save freightage where liquor is sold.

In some cases it is uneconomical to recover the fixed ammonium salts, and free ammonia only is recovered, the fixed salts passing away with effluent. There is no serious objections to this practice, as in congested and industrial areas river water containing effluents is collected, filtered and chlorinated, and then recirculated for domestic use.

The practice of chlorinating water for drinking purposes has led to a serious endeavour to remove phenols from the effluent of ammonia stills. Apparently, if phenols are present in water before chlorination, the chloro-phenols formed, even if present in only very slight traces, impart a very disagreeable taste to the water.

Through the courtesy of the Koppers Company of America, the writer was able to inspect one of their plants for dephenolating gas liquor. At the time of inspection the plant was running quite smoothly, treating about 33,000 U.S. gallons of liquor per day and reducing the phenol content from 2000 parts per million to less than 50 parts per million, below which concentration the subsequent chloro-phenol apparently does not make the water unpalatable. The cost of such treatment, including capital costs, are extremely low; and when credit is allowed for the phenol which is recovered and sold, it is estimated that the process will show a small profit.

The methods of actual recovery of ammonia are substantially the same as our own. In the indirect process there is a slight divergence from our practice when the "Intensive" washer is used for scrubbing the gas. This consists essentially of a number of small tower scrubbers with wooden fillings. Each tower has its own separate liquor circulating system, and a heavy flow of liquor is pumped over the filling; the flow of liquor being counter-current to the gas. The results do not compare very favourably with those obtained on rotary scrubbers under similar conditions, and the power requirements and back pressure are probably higher than with the modern horizontal washer or vertical centrifugal washers. This intensive washer was developed, presumably, for use with water that was either brackish or contained sediment in suspension, or temporary hardness likely to deposit salts on contact with ammonia. Consequently it contains an open filling, designed more for accessibility for cleaning than for high efficiency in ammonia recovery and concentration of liquor.

With modern developments, where cooled fixed ammonia liquor is used in place of fresh water, the above contingencies

do not arise. Consequently, rotary scrubbers are receiving serious consideration in America.

The vertical centrifugal washer, particularly of the Feld design, is also used extensively.

In the direct system of ammonia recovery there are two interesting features. First, it is quite customary to find on the large works saturators built in single units treating 20,000,000 to 30,000,000 c.ft. of gas per day, which is a very considerable throughput. Secondly, it is now the practice to locate the actual saturators outside the building, controlling the temperature of them by the usual types of preheaters regulating the temperature of the gas before it enters the saturator. The preheater, together with the exhauster and "P. & A." tar extractor, are inside the building; and this method appears to be quite satisfactory, in spite of the extremes of climatic conditions experienced.

When it is considered that a semi-direct installation designed to treat 10,000,000 c.ft. per day would have two saturators, each about 12 ft. 6 in. diameter, it is obvious that a considerable saving can be effected by putting these saturators outside in the open, without buildings.

### PURIFICATION FROM $H_2S$.

This subject has received considerable attention in America; and very serious efforts have been made in recent years to perfect processes that accomplish the work of iron oxide boxes at a comparable operating cost, and that have the added advantage of requiring less ground space than is necessary for the usual installations of oxide boxes. Undoubtedly, in America, economy in ground space is of real importance; and processes with this object in view are assured of support from every direction.

The Koppers Company of America have made a very material contribution towards the solution of this problem by developing four different processes for purification by liquids. Mr. C. J. Ramsburg reports in the "Gas Age-Record" for Feb. 16, 1929, that there are now over 60 plants where liquid purification is in use, treating in all over 500 million c.ft. of gas per day. The first of those processes is the original "Seabord" process which has been described frequently in our Technical Journals. Briefly, it consists of treating the foul gas, after ammonia recovery, with a solution containing about 1 to 3 p.ct. of sodium carbonate. The mechanism of the absorption of $H_2S$ is as follows:

$$H_2S + Na_2CO_3 = NaHS + NaHCO_3.$$

This reaction is usually carried out in a tower scrubber absorber, from which the solution containing the $H_2S$ is withdrawn and activated continuously. The activation is effected by treating the foul solution with air in a second scrubbing system, the reactivated sodium carbonate solution being returned to the $H_2S$ absorber.

This process will remove between 90 and 95 p.ct. of the $H_2S$ and HCN, with a smaller proportion of $CO_2$; the remaining $H_2S$ being removed by oxide catch boxes. The volume of air required for activation is about three times the volume of gas purified, and it is stated that for every 8 lbs. of sulphur removed from the gas, 1 lb. of sodium carbonate is consumed by the formation of sodium thiosulphate, and sodium thiocyanate which are not re-converted to $Na_2CO_3$ by air. The figures available suggest the operating cost of this process to be about 0·5c. per 1000 c.ft. of gas treated, in which is included the removal of HCN.

In many cases the air from the actifiers of these plants, containing about 0·15 p.ct. $H_2S$ by volume, was blown into the atmosphere; but this was soon found to be impracticable in the cases of large plants situated in densely populated or residential districts. At some works it has therefore been the practice to use this air in the generators of water gas plants, and also to burn the $H_2S$ by using the air in producers, in combustion chambers of retort settings, and in boiler furnaces, &c. These latter proposals cannot be considered very satisfactory, as, though the sulphur is not discharged into the air as $H_2S$, it reappears as its $SO_2$ equivalent. Mr. Ramsburg points out that by using actifier air in place of clean air in the boilers of a power station, under normal conditions, the $SO_2$ content of flue gases would be increased from 0·09 p.ct. to only 0·24 p.ct. This, however, would seem a very substantial increase.

More satisfactory methods appear to lie in the alternative processes, whereby the sulphur is not discharged into the atmosphere in any form, but is recovered by oxidizing the $H_2S$ in the fouled absorbing medium. These comprise the "Ferrox" process, the "Nickel" process, and the "Thylox" process. Particulars of the latter, however, are not yet published in full. Substantially, all three processes consist of washing the crude gas with a solution, or suspension, of suitable metallic oxides in sodium carbonate. This absorbs the $H_2S$ and HCN —in the case of the "Ferrox" process, in the following manner:

$$H_2S + Na_2CO_3 = NaHS + NaHCO_3$$
$$3NaHS + 3NaHCO + 2Fe(OH)_3 = Fe_2S_3 + 3Na_2CO_3 + 6H_2O.$$

The HCN is absorbed in the following manner:

$$Na_2CO_3 + HCN = NaCN + NaHCO_3.$$

NaCN reacting with any free sulphur as follows:

$$NaCN + S = NaCNS.$$

The liquid flowing to the activator contains, therefore, chiefly sodium carbonate, bicarbonate, and thiocyanate, with possibly some unchanged sodium hydrosulphide in solution, and both ferric sulphide and unchanged ferric hydroxide in suspension. Air is blown through the liquid, liberating free sulphur and reproducing the ferric hydroxide by the following reaction:

$$2Fe_2S_3 + 3O_2 + 6H_2O = 4Fe(OH)_3 + 6S.$$

The sulphur separates as a scum on the activated liquid, and is continuously floated-off and recovered.

The air required in the sulphur recovery processes is considerably less than in the "Seabord" process, being only about 4 p.ct. of the volume of gas treated. It will be noticed, however, that both sodium thiocyanate and sodium thiosulphate are formed; and since these products are not reconverted to sodium carbonate by aeration, they must accumulate in the wash liquor, and periodically have to be removed, thereby causing a consumption of sodium carbonate, which must be added to replace that converted to sodium thiocyanate and thiosulphate.

Table IV. is reproduced from a publication of the Koppers Company, and represents the costs of liquid purification by the "Ferrox" process.

**TABLE IV.—*Cost of Gas Purification by "Ferrox" Sulphur Recovery Process.***

10,000,000 c.ft. coal gas per 24 hours.
$H_2S$ removed, 400 grains per 100 c.ft.
HCN removed, 40 grains per 100 c.ft.

| | Per Day. |
|---|---|
| Power for pumps, blowers, lighting, filtration, &c., 2550 H.P.-hr. at 1 cent | $25·50 |
| Soda, 0·35 lb. per 1000 c.ft., at 1·5 cents | 52·50 |
| Iron compound, 0·28 lb. per 1000 c.ft., at $7·50 per ton | 10·50 |
| Labour, 4 men at $5 | 20·00 |
| Miscellaneous | 6·00 |
| Total | $114·50 |
| Credit for recovered sulphur, 3000 lbs., at ½ cent | 15·00 |
| Net cost per day | $99·50 |

Net cost per 1000 c.ft. of gas, 1 cent.

It is interesting to consider the application of liquid purification to English conditions. First, it must be remembered that the $H_2S$ content of crude gas under English conditions is much higher than in American practice—due, principally, to the difference in sulphur content of the coal carbonized. We have a sulphur content of the order of 700 grains $H_2S$ per 100 c.ft. of gas against 350 grains per 100 c.ft. in American practice. In view of the higher initial sulphur content of the crude gas, a higher efficiency of removal is required to give a final sulphur content sufficiently low to allow of the use of a considerably reduced volume of iron oxide in catch boxes. Furthermore, since the production of sodium thiosulphate and sodium thiocyanate are proportionate to the sulphur content of the gas, a higher figure for soda consumption is to be anticipated when purifying gases with a higher sulphur content.

These secondary compounds have to be removed continuously to prevent accumulation; and as the solution has a very high oxygen-absorption capacity, it would probably be regarded as an undesirable effluent, and if produced in large quantities would be disposed of only with difficulty.

The "Seabord" process is impracticable for Great Britain, since legislation forbids the discharge of $H_2S$ into the atmosphere, and limits that of $SO_2$.

The sulphur recovery processes, particularly in their newest forms, may be said to have possibilities for us; and I would suggest that if such processes can be worked with an operating cost of not more than 0·5d. per 1000 c.ft., and with an attendant saving in the space required for oxide boxes, they would probably receive serious consideration from undertakings situated in congested areas and in need of space for expansion.

### GAS DEHYDRATION.

The development of gas dehydration in Great Britain has been watched in America with considerable interest, and its application to American practice is progressing rapidly. The importance of distributing dehydrated gas has been demonstrated by reference to the experiences of those undertakings who distributed only natural gas or both natural gas and manufactured gas at low pressures. In addition, by the experiences of those who distributed both manufactured gas at low pressures, and also after compression in high-pressure systems and re-expansion through low pressure governors.

Natural gas contains no water vapour, and manufactured gas, if compressed to (say) 30 lbs. per sq. in. and cooled, is virtually dehydrated when re-expanded to atmospheric pressure or a few inches water gauge above atmospheric pressure. There had been, therefore, for many years, distribution systems supplied with wet and dehydrated gas; and since the distribution of dehydrated gas had appeared advantageous, in that costs of meter maintenance, clearing of stoppages, corrosion, &c., were

always considerably lower than in similar systems through which wet gas was distributed, a Committee was formed in 1926 to examine the possibilities of dehydrating gas by various methods, with a view to dehydrating all gas before distribution. This Committee considered the following methods: Refrigeration, compression, absorption by liquids, &c., and presented their report at the American Gas Convention, 1928. Table V. gives the comparative costs calculated for the various methods considered.

TABLE V.—*Comparative Costs of Gas Dehydration.*

[Report of Committee of American Gas Association, 1928.]

| Method of Dehydration. | Cost per 1000 C.Ft. Coal Gas. | | Cost per 1000 C.Ft. Water Gas. | |
|---|---|---|---|---|
| | Summer. | Winter. | Summer. | Winter. |
| Hygroscopic brine . . . . | $·0071 | $·0064 | $·0071 | $·0064 |
| Refrigeration— | | | | |
| Expansion machine . . . | $·0090 | $·0081 | $·0113 | $·0104 |
| Absorption machine . . . | $·0074 | $·0066 | $·0097 | $·0089 |
| Compression— | | | | |
| Present distributing at 15 lbs. to increase pressure to 33½ lbs. in winter and 21½ lbs. in summer . . | $·0058 | $·0091 | $·0060 | $·0097 |
| Additional cost for cooling, &c., where distribution pressure is 30 lbs. gauge . | *Nil* | *Nil* | $·0010 | $·0011 |

These figures show that the most economical method of gas dehydration is by removing the water vapour by liquid absorbents. Exception is made in the cases where, in ordinary circumstances, gas must be compressed to pressures above 30 lbs. per sq. in. (gauge) before distribution, being dehydrated later when expanded to the pressure prevailing, normally in the distribution system.

In this case the main cost of dehydration is covered by the cost of compressing for distribution. Similarly, if the normal pressure before distribution be about 15 lbs. per sq. in. (gauge) it may be economical to raise the pressure further to 30 lbs. per sq. in. (gauge), and thereby obtain the advantage of dehydration at the cost of raising the pressure the additional 15 lbs. per sq. in.

Consequently to this report, and the active interest shown towards this subject, arrangements have been made by the Koppers Company of America whereby the "Dri-Gas" process is available for installation in American gas undertakings, and also a plant is being erected by West Gas Improvement Company at Norfolk, Virginia. This process is that which has been developed in Great Britain by Messrs. W. C. Holmes & Co., Ltd., and uses calcium chloride solution as the absorbent for water vapour.

It is to be anticipated that gas dehydration may be used extensively in conjunction with the waterless gasholder, which has been so widely adopted in America. Where wide variations in climatic conditions and atmospheric temperature occur, the deposition of water from humid gas cannot be prevented; and where the amount of water deposited has been found to be considerable, it has necessitated provision of tar dehydrators working continuously in order to maintain the uniform consistency of tar used as a sealing medium. Obviously it is preferable to prevent the deposition of this water rather than to provide means for its removal after deposition, particularly when prevention, by dehydrating the gas, confers not only benefits to the working of the holder, but also to the distributing system and the consumer beyond the holder.

## NAPHTHALENE EXTRACTION.

From observations in America, naphthalene might be said to be truly cosmopolitan, and where not eliminated from the gas before distribution is the cause of stoppage of gas supply and other difficulties similar to those experienced by ourselves. Unfortunately, in addition to those caused by naphthalene, there are a considerable number of stoppages due to the deposition of gummy substances in district governors, service governors, and in consumers' meters. These gums are ascribed to the presence of indene and similar compounds in the gas.

Indene would appear to have a higher vapour pressure than naphthalene, and would not, therefore, be deposited from the gas as readily as the latter, or, conversely, coal gas has a greater carrying capacity for indene than for naphthalene. It might be anticipated therefore that indene would not cause stoppages as readily as naphthalene. Unfortunately, owing to the high calorific values maintained and the large amounts of carburetted water gas distributed, there is always condensation of oil vapours and the consequent deposition of oils in the distributing systems, particularly where a considerable proportion of carburetted water gas is sent out. Indene is highly soluble in this "drip oil," and when in solution is polymerized to form gumming substances. Stoppages due to gums therefore ensue. Since it is not always possible to prevent the deposition of drip oil, the most satisfactory solution appears to lie in removing the indene and similar compounds from the gas. This may be effected by scrubbing with suitable solvents, and is found to take place simultaneously with the removal of naphthalene when the gas is scrubbed with gas oil in sufficient quantity.

The amount of gas oil necessary to remove the whole of the gum forming compounds appears to be more than is necessary for complete removal of the naphthalene; but with a consumption of about 30 to 40 U.S. gallons of gas oil per million cubic feet of gas, satisfactory naphthalene extraction is obtained, and, in addition, a considerable amount of the gum-forming compounds are removed. Furthermore, it is claimed that this oil washing prevents gum formation not only by reducing the indene content of the gas, but also by removing a fair proportion of the oil vapours which normally would condense to give drip oil, so that both factors are reduced.

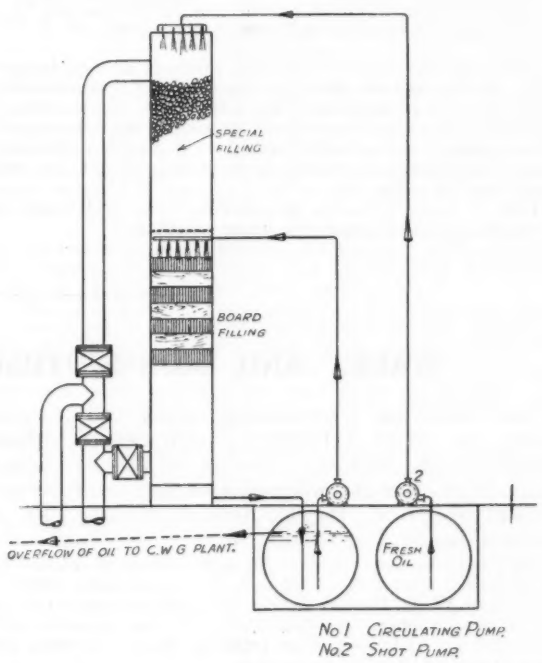



**Fig. 4.—Diagram and Flow Sheet for Tower Scrubber. Naphthalene Washer.**

Oil washing is carried out in America chiefly in two different types of apparatus. Firstly, the immersion washer, which consists of a series of bubbling devices or contactors, by which the gas is brought into contact with the oil. Provision is made for circulating the oil continuously through the washer; and since the washing is effected in neither true counter current nor in multiple stages, the amount of fresh gas oil added is necessarily high in order to keep down the concentration of naphthalene (below 1 p.ct.) in the wash oil, and so minimize the naphthalene content of the gas leaving the washer.

Table VI., published by Mr. R. C. Downing, of the Lowell Gas Company, Mass., gives typical operating figures obtained with this type of apparatus.

TABLE VI.—*Naphthalene Extraction using "Immersion" Washer.*

| | |
|---|---|
| Gas treated per 24 hours . . . . . | 2,200,000 c.ft. |
| Gas temperature . . . . . | 75° Fahr. |
| Differential pressure across apparatus . | 4 in. W.G. |
| Inlet naphthalene content of gas . . | 12 grains per 100 c.ft. |
| Outlet naphthalene content of gas . . | 2 grains per 100 c.ft. |
| Fresh oil added and used . . . . . | 0·24 gallon per 1000 c.ft. |
| Naphthalene content of spent oil . . | 0·8–0·9 p.ct. by weight. |
| Calorific value of gas at inlet to washer | 527 B.Th.U. per c.ft. |
| Calorific value of gas at outlet of washer | 525·3 B.Th.U. per c.ft. |
| Loss in calorific value of gas . . . . | 1·7 B.Th.U. per c.ft. |
| Cost of process excluding capital charges | 0·125 cent per 1000 c.ft. |
| *Probable cost including capital charges | 0·140 cent per 1000 c.ft. |

* Added by Author.

The second type of apparatus is the improved tower scrubber developed by the Koppers Company. This consists of the usual type scrubber divided into two halves. The lower half contains a filling composed of boards on edge, rings or similar material, the upper half containing a special filling consisting of finely divided spirals of steel or other metal similar to steel turnings. Gas oil is circulated continuously over the filling in the lower half, and the naphthalene content of the oil is allowed to increase towards saturation, while, in order to maintain a low naphthalene content at the gas outlet, fresh gas oil is injected into the upper half through a spray header in "shots" at frequent periods. This fresh oil flows over the special filling

and trickles slowly down to join the main circulating system in the lower half.

Table VII. is representative of the working data at one of these installations:

Table VII.—*Naphthalene Extraction using Tower Scrubber.*

| | |
|---|---|
| Gas treated per 24 hours | 24,000,000 c.ft. |
| Temperature | 70° Fahr. |
| Differential pressure across apparatus | 2 in. W.G. |
| Inlet naphthalene content of gas | 10 to 20 grains per 100 c.ft. |
| Outlet naphthalene content of gas | 2 grains per 100 c.ft. |
| Oil circulation in lower half of tower | 11,000 U.S. galls. per hour |
| Oil circulation in U.S. galls. per 1000 c.ft. | 11 |
| Approximate power consumption for pumps | 6 H.P. |
| Fresh oil supplied in shots | 30 galls. per hour |
| Fresh oil added and used | 0·030 galls. per 1000 c.ft. |
| Loss in calorific value of gas | 0.5 B.Th.U. per c.ft. |
| Cost of process, including capital charges | 0·12 per 1000 c.ft. |

The respective costs of the two methods do not appear to differ greatly, and the differences in details of operation will be appreciated by comparison of the other items in the tables. It is of interest to note that while in the case of the tower scrubber there is less gas oil actually used, there is considerably more oil being circulated continuously, necessitating pumps, &c., being duplicated for safety.

Both a lower reduction in calorific value and lower back pressure appear to favour the tower scrubber.

Naphthalene extraction is a process which, though effected in a manner apparently simple, is governed fundamentally by several important factors. It consists of stripping the gas of a constituent which is present initially in very low concentrations. At the same time, the quantity of absorbent to be used must be as small as possible, in order that the calorific value of the gas shall not be reduced appreciably nor caused to vary. Capital costs, labour, attendance, supervision, &c., must all be low, and back pressure to the gas stream at a minimum. The solution of the problem appears to lie in the use of highly efficient washers giving intimate contact between gas and washing medium, preferably in true counter-current, and in several independent stages.

The modern rotary scrubber washers of British practice also appear to achieve these objects in a most economical manner, as will be seen from operating data given below:

| | |
|---|---|
| Capacity of washer | 10,000,000 c.ft. per day |
| Power for washer engine | 3–4 H.P. continuous |
| Back-pressure | 1 in. W.G. |
| Speed of main shaft | 2–3 R.P.M. |
| Inlet naphthalene content of gas | 7–15 grains per 100 c.ft. |
| Outlet naphthalene content of gas | Less than 1 grain per 100 c.ft. |
| Oil consumption | 15–30 galls. per million c.ft. of gas |
| Attendance supervision | 1½ hours per day |
| Reduction in calorific value | Less than 0·5 B.Th.U. per c.ft. |
| Operating cost | Approximately 0·03d. per 1000 c.ft. |

*(To be concluded.)*

# WALES AND MONMOUTHSHIRE JUNIOR GAS ASSOCIATION.

The Wales and Monmouthshire Junior Gas Association visited the Neath Corporation Gas-Works on Saturday, March 16. They were received by Mr. W. Clarke Jackson, the Engineer and Manager, who conducted them round the works, assisted by Mr. F. Dupont, Assistant Manager, Mr. Ivor Thomas, and Mr. Ben Thomas.

Of particular interest were the newly installed water cooled condensers, erected by Clapham Bros., and the condensers erected by W. C. Holmes & Co., Ltd., which replace the previous tower scrubber. Another addition to the equipment of the works is a "Dri-Gas" plant (also by Messrs. Holmes) which was in the process of construction.

Following the tour round the works, the party were conducted to the Council Chamber of the Gwyn Hall, Neath, where a civic reception was extended by the Mayor of the town, Alderman John Davies, J.P., who was supported by the Deputy-Mayor, Councillor Challacombe, and members of the Neath Corporation Gas Committee.

Alderman John Davies, in welcoming the members of the Association, said that under the guidance of their respected and energetic Engineer and Manager, Mr. Jackson, the works had become one of the most up-to-date undertakings in the country. This had been accomplished by Mr. Jackson despite the fact that when he took over control there had been a debt on the works running into four or five figures. To-day this had been wiped out and a new epoch started in the gas industry in Neath with a credit balance and a well-equipped works.

Alderman M. G. Roberts (Chairman of the Gas Committee) also paid a tribute to the good work of Mr. Jackson.

Mr. C. B. Felton (President of the Association) thanked the Mayor for the welcome the Association had received, and expressed gratitude for the kindness always shown by Mr. Jackson to the Juniors.

## CARBONIZATION IN VERTICAL RETORTS—SOME WORKING EXPERIENCES.

By Ivor Thomas, of Neath.

[Extract.]

The plant upon which these observations are based consists of a bench of Woodall-Duckham vertical retorts which was put to work in 1921. Incidentally, this plant is the only one of this system at present at work in South Wales, and misgivings expressed in some quarters at the time of its erection as to its ability to carbonize exclusively Welsh coals have not been borne out in practice. The plant has regularly and consistently exceeded the guarantees of the makers and has in every way justified its erection.

The installation consists of a bench of three settings of four retorts of the usual Woodall-Duckham pattern, each capable of carbonizing five tons of coal per day.

### Advantages of Downward Heating.

The retort in the Woodall-Duckham system is heated by the combustion of a mixture of producer gas and air in a downward direction in a series of combustion flues on each side of the retort. Arrangements are made for air to be admitted at two different levels in the combustion chamber. This gives flexibility in the zoning of heats according to the class of coal being carbonized and the calorific value of the gas to be made.

Downward heating has the following advantages:

(1) It is possible, when desired, to carry maximum temperatures at the top of the retort with moderate temperatures at the bottom. This condition is desirable, when working with a non-swelling or moderately swelling coal.

(2) It is possible by the use of the additional secondary air to ensure maximum temperatures in the middle of the retort and good bottom temperatures suitable for high output of gas under steaming conditions.

(3) The vertical flue construction makes it possible to inspect the heat of the combustion chambers from one level.

### Uniformity of Blending.

At Neath we work exclusively with Welsh coals, and have at various periods tried practically all the coals which can be said to have any gas-making qualities. It is impossible to give detailed results as regards gas-make, &c., of these tests, as they were made in the usual routine of working; but in only a very few instances have we experienced any undue trouble in carbonizing any coal. I mention this because there is a tendency to believe that this type of plant requires specially selected coals. With suitable adjustments of the heat zones and throughput I am confident almost any class of coal can be carbonized. Particular care however is necessary if several different coals of widely different characteristics are required to follow one another through the retort in rapid succession, as in this case, time may not permit the necessary adjustments to be made to suit the particular coal being carbonized. For this reason, uniformity in the blending of the coals used, both as regards quality and size, is essential for easy and regular working. For a number of years we have confined our requirements to two sources, and our limited needs in the quantity of coal enable us to obtain a uniform blend without difficulty.

### Cleaning of the Fires.

Each setting of four retorts is provided with its own producer and regenerator. The former is of the step-grate type, and of ample area. It is charged with unscreened coke from an overhead bunker at intervals of three hours.

The coals in use have an ash content of 7 to 11 p.ct., and this means that the ash content of the coke is about 15 to 20 p.ct. At first, clinkering troubles were experienced, but with a modified method of cleaning the fires these troubles have been minimized. The original procedure consisted of shaking and ashing out the whole of the grate area every two hours. Analysis of the producer gas showed that when the whole of the grate was attended to in this way the quality of the producer gas was reduced very considerably, and nothing like a uniform quality could be obtained. It was proved that if one half-section of the fire was attended to at intervals of two hours, there was less trouble with clinker formation, and the quality of the producer gas was improved, without any appreciable reduction in volume. Since then, the ashing-out period has been extended, so that each half-section of the fire is attended to at intervals of eight hours, and has resulted in more regular temperatures in the

retorts being maintained, besides effecting an appreciable economy in fuel consumption.

### Dust Removal.

The accumulation of dust in the producer gas flues, waste gas flues, and regenerator is a distinct disadvantage, and for the maintenance of good heats its periodical removal is essential. The obstruction of the passages is bound to upset damper regulation, and, in addition to the harm done to the brickwork of the combustion chambers in particular, the labour entailed in its removal is considerable. From observations made, it would appear that most of this dust is carried forward during the cleaning of the fire. It would seem, therefore, to be an advantage if a damper were fitted which could be closed during cleaning operations. It is not advisable to alter the permanent damper adjustments for this purpose; it seems feasible that at least part of the dust could be removed by means of a baffling device fitted in the vertical flue, through which the producer gas passes. The dust would then pass back into the fuel and would finally work through with the ashes. This trouble could undoubtedly be minimized by working with screened coke, but the absence of a screening plant makes this impossible. In this respect the vertical combustion system has an advantage over the horizontal flue type in that any dust carried forward does not settle in the hottest zone, where it is likely to flux, but falls down the flues where the temperature is lower and possibility of fluxing reduced.

### Life of Retorts.

After three years' working it was necessary to shut down a setting for the purpose of renewing the brickwork for about 6 to 8 ft. from the top of the retorts. The panel bricks were in a bad condition and the joints were not sound. The inner faces of the panels had apparently shrunk, causing them to become concave and badly spalled, being covered in every direction by numerous surface cracks. The remainder of the brickwork was sound, and beyond pointing, the joints had not needed any repairs since the plant was put to work. At the base, the combined action of the coke and steam had caused some abrasion to the bottom blocks, but this was not serious. The wearing of the top brickwork may be attributed to the following causes:

(1) Initial combustion at the top, which is usually at the highest temperature.
(2) Rapid temperature fluctuations and consequent uneven expansion.

Under working conditions the face of the retort at the top, forming one side of the combustion chamber, is at a temperature of 1150°-1190° C. The other side of the same brickwork, which is the interior face of the retort, is at a much lower temperature, as it is losing heat to the comparatively cold coal being fed into the retort. When the retort is emptied for scurfing, the temperature of the inside face rises, and unless care is exercised the inside may easily attain a higher temperature than the exterior face, and surface expansion of the interior face would occur and spalling result.

It was seen that some of the worst portions were where the ends of the coal pokers met the retort walls during the operation of rodding. This rodding should be carried out carefully, but the real remedy is to reduce the operation to a minimum. This can be effected by reducing the tendency of the coal to hang up in the retorts; the remedies being (1) the suitable selection and blending of coals; and (2) adjustment of temperature zones in the combustion chamber.

### Scurfing.

A regular scurfing cycle is necessary for steady working, as a smooth surface is essential to proper travel of the coal through the retort. It is our practice to scurf retorts every five weeks. We carried out experiments with a view to speeding up the burning off of retort carbon by utilizing a jet of compressed air at 10 lbs. per sq. in. The rapidity of combustion increased, but not sufficiently to warrant the labour required for continuously directing the jet. The admission of a little steam at the base of the retort hastens the process, reducing it to approximately three-quarters of the time required with air alone.

### Control of Calorific Value.

With vertical retorts the problem of maintaining a constancy is simplified, and resolves itself into keeping conditions in the retort as constant as possible. With a uniform mixture of coal and a regular cycle of rodding there is rarely any necessity to vary the amount of steam entering the retort or the rate of extraction. Any alterations under such conditions are necessitated by a falling off in the temperatures of the retorts, and, being of a temporary nature and usually limited to a small number of retorts, the quality of the gas is not appreciably affected. The vacuum in the retorts is kept at the minimum.

Carburetted water gas is admitted from a relief holder into the foul main at a point furthest away from the retort house governor, and mixes with the gas coming away from the retorts. The volume admitted is limited to approximately 15 p.ct. of the volume of retort gas. By admitting the carburetted water gas at this point we have been able to work down to a 380 B.Th.U. carburetted water gas, and still maintain a very steady 425 B.Th.U. mixed gas. It seems possible that considerable benefit is derived from some of the hydrocarbons of the tar which are picked up by the carburetted water gas and carried forward to the holder. There is no doubt, also, that the passing of the two gases through a common exhauster achieves a better fineness of mixture than any other method.

From a practical standpoint, we have found that mixing in this way is an advantage, inasmuch as the quality of the whole of the gas entering the holders is under the control of the leading stoker in the retort house. For his guidance a test light and direct reading calorimeter are fitted on the charging floor. The gas supply for these is drawn from the outlet of the scrubbers, and a continuous flow of gas with a minimum of time lag is ensured by connecting through into the exhauster side of the foul main.

### Fuel Consumption.

Tests over an extended period have shown that the average fuel consumption is 17 p.ct. on the weight of coal charged, or, in other words, 380 lbs. per ton of coal carbonized. This figure may appear high, but in assessing the thermal value of the process of carbonization the figure that matters most is not the gross amount of fuel supplied to the producer, but the net amount.

The waste-heat boiler at Neath produces a minimum of 2000 lbs. of steam per hour with three beds in use. With an average coal consumption of 36 tons per day, this is equivalent to 1330 lbs. of steam per ton of coal carbonized.

Assuming that under best conditions 8 lbs. of steam can be produced per lb. of coke, the 1330 lbs. of steam is equivalent to 166 lbs. of coke. From this it follows that the net fuel consumption, which may be defined as coke charged to producers, *less* coke equivalent of steam made from waste gases, is 380 lbs., *less* 166 lbs., which is equal to 214 lbs. per ton of coal carbonized, or 10 p.ct. of the weight of coal.

The following are results obtained for the six months ended Dec. 31, 1928, and may be taken as typical of the results regularly obtained:

| | |
|---|---|
| Total gas made (vertical plant only) | 100,940,000 c.ft. |
| Coal used | 5801 tons |
| Gas made per ton | 17,400 c.ft. |
| Therms per ton | 74·8 |
| Coke sold per ton | 8·1 cwt. |

### Vote of Thanks.

Alderman Roberts proposed a vote of thanks to Mr. Thomas for his paper, and this was seconded by Councillor J. R. Jones.

The discussion on the paper was postponed until the evening; and at the generous invitation of Mr. Jackson the party adjourned to the Castle Hotel, Neath, for tea.

Mr. Jackson explained that the Neath retorts were installed in 1920-21 and were started on July 14, 1921. They were put in at an expensive time, and the cost bore no comparison with present-day prices. Despite this fact, the results had been very striking, and had effected such an improvement as more than to justify the expenditure. When the retorts had been put to work there was an overdraft on the Neath Gas-Works of nearly £30,000, and the selling price of gas was much higher than that of neighbouring works. To-day the price of gas was much lower, and the overdraft had been entirely wiped out and turned into a substantial credit. The total expenditure on repairs during these past years was a little over £1000, which worked out at just a little under 3s. per ton of coal handled, and 0·47d. per therm of gas produced.

The coals used were from the South Wales district, except during the 1926 strike, when American coal was employed. The retorts were as good as ever after eight years' working, and gave an average of 15 p.ct. increase in production above the makers' original guarantee. This had been increased to as much as 35 p.ct. when occasion demanded. The retorts had still a long life in front of them before they would require resetting, and they were certainly lower in maintenance charges than were horizontal retorts.

A striking development in connection with Woodall-Duckham continuous vertical retorts in recent years, continued Mr. Jackson, had been the increase in the output of gas per unit of ground space. In comparison with old hand-charged, stop-end, horizontal retorts of twenty years ago, the modern vertical retort installation could produce nearly eight times as much gas per square foot of ground space occupied. Even in comparison with modern machine-charged horizontals, the modern continuous vertical retort installation could produce approximately three times as much gas per square foot of ground space. Many gas engineers during the recent cold weather had been thankful to be possessed of plant which responded to the increased demands. In this respect, a Woodall-Duckham installation of continuous verticals could produce 20 p.ct. more gas than its rated output.

Another point which could be noted about modern continuous vertical retorts was the idea of having a battery of retorts heated by a battery of step grate producers. This lay-out was illustrated in the diagram of the Bow Common plant. It gave

particularly simple heating control, and seeing that the producer gas from a number of producers passed into a common collecting main before the producer gas was fed to the retorts, any inequality of gas production in any one producer was levelled out, and a uniform supply of producer gas was fed to the combustion chambers of all the retorts. Further, any one producer could be repaired without altering the throughput of a single retort in the whole battery.

The meeting ended with a vote of thanks to Mr. Jackson for his hospitality.

# THE USE OF TAR ON ROADS.

By W. E. Cone, Technical Adviser to the British Road Tar Association.

**From a paper before the Municipal and County Engineers, Feb. 14, under the auspices of the Northern District Tar Board of the British Road Tar Association.**

The initial experiments with tar to alleviate the dust nuisance marked the first stage in the development of modern road construction; and it would be interesting to speculate as to the degree of advancement in regard to roads during the last half-century, had it not been for tar. To-day, tar is playing a very important part in the highway development of the country, especially in the efficient and economical maintenance of existing roads, and in the construction of tarmacadam and tar grouted roads.

Tar, like other materials, has not escaped criticism, and so long as the criticism is constructive it may be regarded as an encouraging sign of the continued interest of surveyors in its potentialities. In this respect, the experiment and research now actively proceeding augur well for the future; and while it is dangerous to prophesy, signs are not lacking of the improvements which will be made in the tar-constructed road.

### Success under all Conditions.

The long-life records of this class of roadway show clearly that, as a rule, it has given complete satisfaction, after being laid and tested under every conceivable condition. The successes have been attended by a certain number of failures, but many of these may be justly ascribed to careless manufacture or faulty construction. Investigation has shown that the failure of a tarmacadam road can be attributed to an inferior base, inferior tar, or incorrect grading and temperature conditions in the mixing of the materials. A great deal also depends on how the material is spread on the road, and on the method of rolling; but the former considerations are vital to ultimate success, though at no sacrifice of the latter. In considering these questions we must be largely guided by the nature of the aggregates, of which there are numerous varieties available. A knowledge of the chemical and physical properties of the mineral constituents will serve to indicate this value for road purposes, and will also be of assistance in determining the consistency of the tar to provide the adhesive property necessary to prevent attrition and disintegration. With this information in our possession, we can next turn our attention to the grading of the aggregates.

### Aggregates.

In order to secure a voidless road crust, the selected aggregates should contain a large percentage of angular particles, the gradation of which has been correctly ascertained, so that all voids become filled after rolling. Very little attention has been bestowed upon grading in the past; and the author is satisfied that trouble taken in this direction will be amply repaid in future economic maintenance. In the mixing of the materials, too much stress cannot be laid on the necessity for thoroughly drying the aggregate before it is coated with tar.

The water content of different aggregates varies considerably, and their porosity is deceiving. The extraction of moisture is therefore essential if a proper mixture is to be obtained. It is also well to remember that, in order to ensure a proper coating of aggregate which has not been heated, it is necessary to use increasing quantities of tar, the effects of which will become manifest, when the macadam is laid, by movement and surface distortion in hot weather.

It is of equal importance to avoid too high a temperature in the mixing, otherwise the binding properties of the tar will be destroyed, or the aggregate will be deficient in adhesive properties. The aim should be to adjust the temperature conditions of the aggregate and tar in accordance with their characteristics and the effect of climatic influence, always bearing in mind that the quantity of tar required should be sufficient to coat the aggregate and no more.

### New Specification for Road Tars.

Standardized practice in the manufacture of tarmacadam is not feasible; but much has been done by those engaged in the industry to secure scientific control throughout the whole process. The tar producers and distillers have also concentrated their attention on the preparation of tar best suited to road-making, and the result of their deliberations will shortly be seen in revised specifications for tar. These have been drawn up by the "B.R.T.A.," and officially approved by the Ministry of Transport, and they will constitute the British Standard Specification for road tar. The combination of factors which are essential to the improvement of tarred materials is not so formidable as it appears when reviewed in the light of the advance in the science of road-making; and with the wider technical knowledge now available, it will result in specifications more adapted to modern conditions. The "B.R.T.A.'s" efforts are being directed towards this end; and the practical experiments they have already conducted give strong support to the necessity for more stringent specifications. Nevertheless, they must proceed with caution in their modifications if they are to avoid sponsoring specifications whose practical limitations overshadow their theoretical excellence; and in this respect large-scale trials will be the deciding factor.

The author has endeavoured to show the direction in which further progress lies, and also indicate the steps that are being taken by the tar producer and distiller to improve the quality of the tar. The Association's specifications for tar, already referred to, are of particular interest from the point of view of the revision of the consistency or viscosity of the tar for surface-dressing or tarmacadam purposes. While, in the existing specifications, the minimum limits are 3 and 20 seconds respectively, the Association's specifications provide for a minimum of 10 and 40 seconds respectively; and the Surveyor will have the right to specify the maximum consistencies at his discretion.

The sum total of this means that for surface-dressing purposes the Surveyor will have at his disposal tars of a higher consistency, whose properties are more in keeping with the efficient and economical maintenance of roads, and less liable to "bleeding" in hot weather. Complaints of this kind are directly due to the use of inferior tars, incorrect application, and inadequacy of gritting. The higher consistency provided by the Association's specification makes it possible, with correct treatment, to eradicate this evil; and if surveyors will specify a tar of the maximum consistency, and apply it to the road at a temperature of from 240° to 260° Fahr., immediately followed by a top dressing of approved clean dry ½ in. to ¾ in. chippings, in sufficient quantity to cover the surface completely and absorb any excess tar, immunity from the evil referred to is assured. If practicable, it is advisable to roll lightly the completed surface to ensure that the chippings obtain a grip in the macadam surface and form with the tar an appreciable carpet on the surface of the road. Surface dressing with tar has now come to be regarded as an essential procedure in prolonging the life of water-bound or bituminous-bound roads. In addition to prolonging the life of the road, the non-skid properties conferred by the use of tar on existing road surfaces are now universally admitted.

As a binder for tarmacadam, the higher consistencies provided by the Association's specification for Tar No. 2 are indicative of the demand for a more tenacious and quick setting binder. Such tars are characterized by durability, adhesiveness, penetration, and the power to give a resilient road surface to withstand impact shocks.

With a minimum consistency of 40 seconds, the specification aims at eliminating tars whose plastic range is susceptible to the influence of hot weather, leaving a fairly wide choice in an upward direction at the discretion of the Surveyor. This is said advisedly, because it would be difficult to lay down any hard-and-fast rule for a standard binder. The ideal can be attained only by consideration of the location, temperature, and traffic conditions, and by the choice of a tar of a consistency best suited to the requirements. As a guiding principle, tar of the highest consistency compatible with the handling and laying of the materials should be used.

### Road-Making in the North of England.

In passing, the author would like to refer to three materials which he understands are extensively used in this area for tarmacadam purposes. The materials are slag, whinstone, and granite, the properties of which from his knowledge make them eminently suitable for road-making. In their respective ways they provide a striking illustration of the adaptability of tar as a binder for aggregates of dissimilar properties, and yet whose utilization has met with great success.

The dense impervious structure of whinstone requires that the stone be heated to drive off moisture and retain a temperature of 80° to 100° Fahr. when mixed with the tar. The tar should be of the highest consistency convenient for the subse-

quent handling of the material, and should be applied to the stone at a temperature between 240° and 270° Fahr. Under these conditions of mixing, the author ventures to suggest that the best results would be obtained.

There is, however, scope in another direction for all base materials, whether they be stone or slag, and that is in their utilization as a hot-mix process for the construction of tarmacadam roads.

Where there is no restriction with regard to location and handling of materials, and the latter can be delivered hot to the site, approved aggregates graded from 1½ in. down to 200 mesh, approximately 75 p.ct. 1¼ in. down to ½ in., and 25 p.ct. ¼ in. down to dust, mixed with tar of from 250 to 280 seconds consistency and at a temperature of from 220° to 250° Fahr. for both the aggregate and tar, laid on an approved foundation to a consolidated thickness after rolling of 3 in., will give a compact and durable road, well suited to withstand heavy traffic conditions. The particulars given above closely follow the construction of one of the Association's experimental roads, but they have been slightly modified to suit local circumstances and conditions.

### Penetration Method of Road Construction.

Grouted macadam, or the penetration method of road construction, has largely been superseded by tarmacadam, but it still has a considerable vogue in those districts remote from the vicinity of tarmacadam works. Briefly, the construction of a grouted road consists of a reversal of the method already described for hot-mix tarmacadam, in that the aggregate is laid in the cold untarred state, but its gradation is not so uniformly proportioned. The adoption of the grading already described, with the elimination of the dust, would, in the author's opinion, provide a dense and compact wearing surface, and materially add to the life of the road. It is important that the aggregate should be thoroughly dry before the tar is applied.

The advent of tar emulsions for the surface dressing, patching, and reconstruction of roads in the cold state, has simplified considerably the road-maker's activities; and he no longer fears the vagaries of the English climate. Their application can be made in any weather, and the work can be completed speedily, without loss of effectiveness in the resultant surface. Such speed means not only low labour costs, but the additional advantage of carrying out the surface treatment of roads all the year round.

Every individual in the country is more or less vitally affected by highway transportation, and roads must be maintained as well as built. The selection of a surfacing material should therefore be based on two principal factors—cost and adequacy. There is small doubt that expensive roads have been constructed where a surface at a considerably smaller cost would have been adequate. These are considerations to be taken into account when selecting a material for projected road works. In this respect the advantages of tar are well worth consideration. Not only does this material respond to the demand for economy, but it provides, in its variety of uses, durable and safe roads over long periods of years.

## THE ASSAY OF COAL FOR CARBONIZATION PURPOSES.*

The Fuel Research Section of the Department of Scientific and Industrial Research has just taken another stride forward in justifying its existence in the eyes of fuel technologists by the publication of Technical Paper No. 21, dealing with the above subject. This paper is the continuation of the first Technical Paper, published in 1921, describing the now familiar "Gray-King" assay apparatus designed to assist in the laboratory examination of coals as to their suitability for carbonization, particularly at low temperatures. In the present paper further details are given of the considerations and experiments which led to the original design, together with the results of experience of over seven years' use of the apparatus at the Fuel Research Station and in the laboratories of the Physical and Chemical Survey of the National Coal Resources.

Of particular interest are the modifications of procedure which have been introduced for dealing with strongly swelling coals in the apparatus, so helping to overcome a difficulty which has troubled many workers in this field. Briefly, the "assay" involves the carbonization of 20 gms. of the coal (ground to pass through a 60 mesh 1 mm. sieve) in a standardized silica distillation tube at a fixed rate of heating (up to 600° C.) and under standard conditions, so that the yields of coke, gas, tar, and ammonia can be fairly accurately determined and the quality of the coke assessed. The results of variations from these standard conditions have been investigated and are fully described.

In the case of strongly swelling coals, admixture with coke or electrode carbon (of the same degree of fineness) is advised to a predetermined extent for the coal, so as to produce a strong non-swollen "standard" coke in the assay. The proportion of carbon found necessary to produce such a coke is stated to give a rough indication of the "caking index" or "caking power" of the coal. It is admitted that "such a classification is not precise," and some exception may justifiably be taken by other investigators to the statement that the method is of value, in view of the uncertainty of other methods at present available for the determination of "caking index."

### Survey of Coal Seams.

A valuable feature of this assay is the assistance it is shown to afford in the survey of coal seams, either as a means of evaluating new seams, or for determining the variations of a given seam at the different points at which it is worked. The assay of the different parts of a thick seam may also indicate the most desirable way of working that seam.

A further valuable feature claimed for the method is that it provides a measure of the yields of products obtainable by carbonization of the coal *at the same temperature* on a large scale. Care, however, must be exercised with regard to this correlation, as it is shown that the yields of tar from large-scale plants are usually only from 60 to 80 p.ct. of the assay yields. Further, in the case of the gas, it is shown that both in composition and quantity there is a considerable difference in the yields from the assay and from large-scale plants when using the same coal. These differences are mainly due to the variations in the size of coal and in the rate of heat transfer to the coal in the carbonizing systems.

Several of the results obtained by modification of the conditions of heating are worthy of note. It is shown that an increase in rate of heating (to the standard temperature) gives a slightly higher yield of tar at the expense of the yield of coke, but leads to difficulties with the more strongly swelling coals; the gas yield is only very slightly affected. The results obtained by varying the final temperature to which the charge is raised, confirm the previously established fact that carbonization of coal is a process of fractional distillation. As the temperature increases, the yields of volatile products increase at the expense of the residue. Between 500° and 700° C. the yield of gas is more than trebled, and the yield of liquor is doubled, but the yield of tar appears to reach a maximum at about 650° C., and then declines.

The admixture of inert matter, electrode carbon, is shown to have no appreciable influence on the yields of volatile products from coal. This piece of work is particularly welcome in view of the controversies which have appeared in the literature on this subject.

### An Unfortunate Omission.

There appears to be a distinctly unfortunate omission throughout the report. A large number of yields obtained by means of the assay from different coals under various conditions are tabulated; these include both the weight and volume of gas produced, but only in one case (Appendix 3, p. 33) is an indication given of the thermal value (yield in therms) of the gas. There is very little point in comparing yields of gas by volume if the calorific value is not stated in each case. A statement of the composition of the gas, from which the approximate calorific value could be calculated, would be welcome. There is little doubt that another extremely welcome addition to the information contained in this paper would be results obtained by high-temperature assays (1000° C. to 1200° C.) on a similar scale, not primarily for the comparison of yields and quality of products obtained by high and low temperature carbonization, but with a view to obtaining closer correlation between assay results and those from the more modern industrial carbonization processes.

The paper concludes with four valuable appendixes. The first consists of a useful six-page reprint from "Methods of Analysis of Coal," Physical and Chemical Survey Paper No. 7, and includes a detailed description and illustrations of the Gray-King assay apparatus and method of operation. The second appendix gives details of the standard conditions and notes on the assay which must be observed to ensure that comparable results may be obtained by different operators. This includes particulars of a distillation apparatus for the determination of water in the liquid products from the assay.

A larger scale assay plant which has been evolved at the Fuel Research Station and in which the charge of coal is 500 gms. (so that sufficient tar is obtained for investigation) is fully described in Appendix 3.

Appendix 4 consists of a table, reprinted from Technical Paper No. 1, in which are given the results obtained by Gray-King assays of a range of ten coals in which the coke yields varied from 70 p.ct. to over 94 p.ct., while the oil (or tar) yields varied from nearly 16 p.ct. down to 1 p.ct.

* Department of Scientific and Industrial Research. Fuel Research Technical Paper No. 21. Part II. By J. G. King, Ph.D., A.R.T.C., F.I.C., C. Tasker, M.Sc. (Tech.), A.I.C., and L. J. Edgcombe. London: H.M. Stationery Office, 1929. Pp. VI. + 34. Price 1s. net.

# LONG DISTANCE TRANSMISSION OF COKE OVEN GAS IN GERMANY.

By Dr. Alfred Pott, Dr. Ing., Essen, Germany.

**[From the Second International Conference on Bituminous Coal, Pittsburgh, Pa., Nov. 19-24, 1928.]**

In the fall of 1926 about 90 p.ct. of the coal mines of the Rhenish Westphalian Coal Syndicate formed the Coal Exploitation Corporation, now called the Ruhrgas Corporation. Its purpose was to develop the chemical processes of coal refinement, such as hydrogenation of coal, production of synthetic ammonia using coke oven gas as source of hydrogen, low-temperature carbonization of coal, the combustion of powdered coal, and the building up of a large scale gas distribution system, with the Rhenish Westphalian industrial district as the base.

### Output of Ruhr District.

One hundred and twenty million tons of coal were mined in the Ruhr district in 1927, and about 27 million tons of coke were produced. This coke production is the equivalent of about 10,000 million cub.m. of gas. Of these quantities of gas we have been using 45 p.ct. for heating the coke ovens, and about 45 p.ct. as fuel for the steam plants at the mines. Only the small balance of 10 p.ct. was supplied for outside uses —namely, for the generation of electric power, and for lighting of municipalities, and for metallurgical purposes.

The use of valuable coke oven gas for the generation of steam at the mines and for the heating of coke ovens must to-day be considered uneconomical.

The conditions in other German mining sections are quite similar to those in the Ruhr district, so that there, too, the problem of gas distribution is being seriously considered. The geographical distribution of the individual German coalfields is extremely favourable for the realization of the ultimate plan which has as its aim to offer the most economical supply of gas to as many parts of the country as possible. Primarily, the scheme visualizes main lines extending from the various coal centres in all directions where the distribution of gas promises to be a lucrative proposition.

The all-important question was, What pressure conditions should exist in an overland gas distribution of such proportions? That is, What pressures and pipe diameters must be used in order to make the transport of gas economical?

This question cannot be answered in a general way. The respective local and technical conditions have to be taken into consideration. Special attention has to be paid to two important factors: First, the pressure which can be used, based on the present status of pipe line engineering and on the quantity of gas and distance; and second, the influence of the pressure on the composition of the gas, and on safe transport.

The principal items of the cost of gas distribution are the interest on capital investment, the operating cost of pipe lines, compressor plant, and measuring equipment, and also the losses of gas.

For the transportation of a certain quantity of gas over a certain distance these costs will vary, depending on the selection of pipe diameter and the relative initial pressure which is determined by it in conjunction with the quantity and distance. In order to eliminate the rather extensive calculations to determine the economical diameters and starting pressures for each case, we have endeavoured to calculate in a general way the variation of the economical diameter in relation to the increase of quantities and distances, based on conditions prevailing in Germany. We have succeeded in charting the results in a rather simple form, so that for each rate of gas flow and for each distance, the most economical diameter and the initial line pressure determined by these factors may be read. These tables have confirmed again the long known fact that the transport of large quantities of gas at shorter distances is most economical by use of large diameter pipe lines at a low pressure. If it is desired to convey the same quantity of gas over a longer distance smaller diameters and higher pressures should be used. Initial pressures up to 30 atmospheres and pipe diameters of about 500 mm. (20 in.) were found to be required.

### Peculiarities of the Ruhr District.

A special condition exists in the Ruhr district which had to be considered. A large quantity of the available gas will be used in close proximity to its point of origin in the Rhenish Westphalian industrial district itself. Here are numerous industries for which, according to past experience, the introduction of gaseous fuel has been found to be particularly desirable, and which, by the nature of things, would have a large consumption of gas. It would be uneconomical to compress the gas immediately to a very high initial pressure and have it available at an unnecessarily high pressure within the distance of 60 to 70 kilometres. If we take further into consideration that the Rhenish Westphalian industrial district, with its numerous mines located in close proximity to each other (there are 358 mines within an area of 1200 sq. kilometres), is subject to considerable underground earth movements, this feature would also make a low initial pressure very desirable. After having considered fully all the advantages and disadvantages, an initial line pressure of from 3 to 6 atmospheres (about 45 to 90 lbs.) was decided upon.

The lines are sufficiently large to transport the amount of gas required over a distance of 90 to 100 kilometres, even under the assumption of the highest available volume of gas. If in the course of development it should prove necessary to convey large quantities still further, provision has been made to instal additional intermediate compressor stations at a distance of 60 to 70 kilometres at points where the consumption of large gas quantities has already taken place due to the industries. By applying a suction pressure of 1 to 2 atm., the cost of the intermediate compression can be greatly reduced. The new initial line pressure will then amount to 12 and up to a maximum of 20 atmospheres. At these pressures the lines call for a diameter of 700 mm. and down to 400 mm. (28 in. down to 16 in.).

This solution can of course not be generalized. For instance, next year a line two hundred kilometres in length is to be built where the gas is immediately compressed to the required pressure of 12 atmospheres (175 lbs.).

The influence of the pressure on the separation of possible quantities of naphthalene contained in the gas is serious. The difficulties are well known which most of the gas plants suffer through the naphthalene depositing in a fine, laminated form which sticks to the pipe, and causes any line, no matter how large, to become completely clogged within a short time. The higher the pressure under which the gas is kept, the more naphthalene will naturally be deposited. In spite of this, experience so far has shown that with higher pressures troubles due to deposit of naphthalene occur much less frequently than at lower pressures. Investigation on existing long distance gas lines has shown that the naphthalene at higher pressures separates in an entirely different form from that at lower pressures, not in a laminated deposition, but partly as a solid crust on the pipe walls, and partly dissolved in the compressor oil which was carried along by the gas. Above certain pressures, as can readily be understood, the precipitation of the naphthalene takes place only in this solution in oil, and can be removed from the line without difficulty through the water seals.

### Complete Naphthalene Removal.

In order to remove all uncertainties in this regard, and to secure the safe delivery of gas free from all possibilities of trouble, a process has been developed to be used in connection with this long distance gas project for the complete removal of naphthalene from the gas.

### No Construction Problems Involved.

Since we now possess a material which, thanks to the successful development of modern welding practice, can be joined by gas and electric welding, no difficulties confront us in the construction of long distance gas lines even on the largest scale. The problem of pipe line construction even for the highest pressures may to-day be considered as being completely solved. The material most suited for high pressure lines is steel having a tensile strength of 34 to 41 kilogrammes per square millimetre (38,000 to 58,000 lbs. per square inch), and an elongation of more than 25 p.ct.

The use of a harder steel is generally not advisable in view of the imperfections of the welding seam. The steel tubes of largest diameter are furnished by the German tube companies in water gas welded pipe (from 300 mm. (12 in.) up to the largest diameters); below these sizes seamless tubing is employed (from the smallest diameter up to 500 mm. (20 in.)). The length of the seamless tubes is 13 to 16 m. (42 to 50 ft.) and the length of the water gas welded tubes is 8 m. (about 25 ft.). For the construction of long lines it is preferable, in case water gas welded pipes are used, to weld two pieces together at the mill so that lengths of 16 m. (about 50 ft.) are available. By that means the number of welds in the field is reduced to one-half, inasmuch as welding in the field requires more time than it does in the mill and a considerable time saving is attained.

One of the primary requirements for the construction of a good pipe line is a first-class welding crew. The question whether gas or electric welding should be employed cannot be answered offhand. Judging from the results of investigations up to date there should be no difference in the quality of the welded seams.

For the welded connections of individual pipe lengths many schemes have been prepared during recent years. It is necessary to find a connection which is very simple to weld, and which has a great elasticity against the forces acting both vertically and longitudinally in relation to the axis of the pipe, and where the welding seam itself is not affected by these forces. Since the question of couplings for a high pressure pipe line is of the highest importance, numerous tests have been made

along this line before starting actual construction. The results have shown that one coupling, the so-called "Kloepper" coupling, above all others possesses all the above-mentioned characteristics in the highest degree. In the construction of the new line this coupling is being used to a great extent, and is especially preferred in districts where movement of the subsoil is to be feared, as in the mining districts and at railway and main road crossings.

Of special value is also the so-called ball coupling, which in principle is identical with the "Kloepper" design, only the couplings and tube ends are so designed that the tubes can be welded together at an angle. This coupling enables us to change the direction of the line up to 6° without the use of special elbows.

The laying of the line is generally at a depth of about 80 cm. (about 32 in.), which is sufficient in Germany to protect the pipe line against excessive fluctuations in the temperature. Nevertheless the use of expansion couplings could not be entirely eliminated, especially near gate valves and in mining regions.

The laying of pipe lines in Germany can, in most cases, only be done on highways and streets. Although this is favourable for the delivery of the materials, the actual work of laying becomes much more difficult, since the majority of the streets are crowded with pipe lines, cables, and street car tracks. For this reason the use of trench diggers, so highly developed in the United States, cannot be considered. The digging of pipe trenches has to be done by hand, and with the greatest possible care. Furthermore, the maintenance of traffic during the construction work has to be fully considered.

On account of these special road conditions the laying of lines is done as follows: The tubes assembled to make up the right length of line are laid out upon supports about 1 m. (3 ft.) high, and there welded together in sections about 100 m. (300 ft.) in length. After closing the two ends of this section of the line by means of covers, it is then put under pressure, the pressure equalling the final operating pressure of the line. The welded joints can very easily be checked for leaks by soaping them. Meanwhile the pipe trench has been dug out underneath the supports of the pipe strand, and the strand of about 100 m. is then lowered uniformly into the trench by means of cranes of special design mounted on trucks.

The method has the following advantage: Only a narrow strip of the road is temporarily blocked against traffic, 60 p.ct. of the welding can be done outside the pipe trench, and therefore in considerably less time than would be possible in the trench itself; the expensive digging of coupling holes is completely eliminated; more rapid laying of the line at a lower cost is the natural result.

In order to be able to test the tightness of connections welded within the pipe trench, greater lengths between two valves or representing an average distance of 2 to 3 kilometres are afterwards retested under the regular operating pressure.

### Protection Against Corrosion.

A very essential factor in the durability and safety of operation of the line is its protection against corrosion. This is usually taken care of by a special pipe insulation consisting generally of a jute-like cloth covering, and a layer of an insulating material. The cloth covering usually consists of impregnated jute; or wool felt is used. The best insulator has proved to be natural bitumen, as it does not harden or become brittle as is the case with many other insulating materials. The quality of being leak-proof and acid-proof, so important in insulating materials, is retained for a long time. The insulation of the pipes, with the exception of the couplings, is done mechanically in the tube mills where uniform and careful workmanship is guaranteed. The shipment of the insulated pipes must, of course, be handled with very great care; it is further advisable not to expose the pipe too soon in the laying of strands, so as to avoid damaging the insulating material. It is of great importance to safeguard the line against electric currents in the ground. Recently objections have been raised against the flange insulations which formerly were often used, because in most cases the insulator consists of soft para rubber, which is subjected to the influence of the gas. Inasmuch as caoutchouc (India rubber) is soluble in hydrocarbons, and furthermore since small quantities of organic sulphur are continually absorbed from the gas, a hardening and embrittlement of such connections could hardly be avoided. On the other hand, the method of indirect protection against earth currents through electric counter action is becoming more and more important. It is not possible to establish general guiding principles for this application, since the strength of currents as well as the character of the ground demand different treatment. For the time being the best system is to avoid ground currents by proper provision at the power plants, and the permanent supervision through measurement of the intensity of the current at the points in question.

The above described method of laying is generally being employed in the installation of the pipe lines for the long distance gas distributing system from the industrial district.

### Extent of Long Distance Lines.

By the end of 1929 about 650 kilometres of lines will have been laid. The Ruhrgas Corporation has acquired by purchase the existing system of the Rhenish Westphalian Power Corporation, consisting of lines totalling 300 kilometres in length and covering a district of about 766·5 square kilometres, and by the end of the year 1929 a network of pipelines, altogether 950 kilometres in length, will be available to bring the excess gas production of the coke plants to economical use. Through this system a territory of about 11,000 square kilometres, having a population of about ten million people, can be supplied with gas. The gas supplied through these lines will by the end of the coming year amount to about two billion cub.m. annually. This pipe line system will receive its supply of gas from the individual coal mines of the Ruhr district.

In the beginning of this project we had to figure with connections to about 125 individual mines. Since the autumn of 1926, however, the conditions have changed considerably, since the coke industry of the Ruhr mines has undertaken rationalization and modernization of its plants on a large scale. The numerous coke plants of individual mines, with an annual production of 100,000 tons of coke each, were considered antiquated. New coke plants had to be built. The modern construction of coal-mixing plants, and the continuous progress in mechanization means of coke plant operation have made it possible to concentrate the production of coke in a large central coke plant supplied with coal from several mines. For this reason only 45 new coke plants of 260 ovens or over need now to be connected to the long distance gas system, having a daily capacity of up to 4000 tons of coal; it must be kept in mind that the oven chambers have increased in size much more than in numbers, since chambers up to 6 m. high and 13 m. long can to-day be uniformly heated. Such central coke plants have a gas production of 400 to 500 million cub.m. of gas per year, so that any one of these alone could, for instance, furnish the present requirements of our capital, Berlin.

It must be considered as a fortunate coincidence of several independent circumstances, that just at a time when the project for long distance gas distribution became active, the coke industry, for technical and economical reasons, undertook a programme of improvement which most favourably influenced the execution of this project. The former conditions would have required a complicated and extensive system of collecting lines. Through the concentration of the coke plants into central plants this network of branches shrinks into one main strand with but a few short feed lines.

Another advantage was gained. It was originally planned that all the plants should feed raw gas into the system at low pressure, and that at the edge of the Ruhr district central stations for the refinement and compression of gas would be installed. It was hoped that through this centralized refinement of the gas the highest possible economy would be obtained. But in view of the fact that on account of the changes at the coke plants, only very few of them have gas available in large quantities, this idea had to be completely abandoned. The cleaning, compression, and metering of the gas are now taken care of at the individual mines. The installation of small uneconomical plants is no longer necessary; rather such large quantities of gas are available at the central coke plants that the maximum of economy in respect to the intended installations has already been reached. Furthermore, the equipment and machinery required for the long distance gas distributing system can be supervised by the existing crews at the coke plants, whereby a considerable saving in wages and salaries is attained. For the removal of hydrogen sulphide the dry cleaning process with natural iron hydroxide or other cleaning material has been selected.

Due to the large quantities of gas to be handled daily (300,000 up to 1,600,000 cub.m. in individual plants), cleaning plants are now required of dimensions that had been unknown in Europe heretofore, differing in both design and construction. The building covering the cleaning plant and the covered storage for the cleaning mass, such as are customary at most gas plants in Germany, are now completely eliminated. Furthermore, we forego the use of a special shed for the preparation of the iron hydroxide. By adding small quantities of oxygen to the gas the material is regenerated in the box proper, so that only a single filling and discharging of the boxes is required, resulting in a material immediately saleable, containing at least 48 to 50 p.ct. of sulphur. The charging and discharging of the boxes is done from above. All mechanical equipment, such as extensive and complicated conveyors, as far as they are not useful for other operations in the coke plant, are eliminated, since they cannot be put to full economical use on account of the intermittent cleaning operation, the filling and emptying of a box taking place only once a year. The cost of cleaning per cubic metre of gas in these installations has been reduced to a fraction of the usual figure.

### Method of Compressing Gas.

The compression of the gas is ordinarily done by means of piston compressors directly coupled to steam engines. This type of machinery was selected on economical and technical grounds. The present possibility of using most of the waste products produced in coal mining for boiler fuel at a high efficiency, either on chain grates or in the shape of pulverized fuel, permits the generation of very cheap steam, so that the

somewhat unfavourable steam consumption of the piston compressors can be overlooked.

An electric drive might have been considered if the current were cheap enough, but here another advantage of the piston engine asserts itself, *i.e.*, its flexibility in speed regulation. This can only be approached with an electric drive by the installation of expensive equipment, which unavoidably lowers the efficiency; that is not the case with a steam driven compressor. Furthermore, the steam driven piston compressor permits of a higher constant overload.

Turbo compressors, due to the low specific weight of the gas, are unsuitable for high pressures, since these compressors have a rather low efficiency. They can be used to advantage only where large quantities of gas are to be compressed to a low pressure. For the intermediate compressor stations where no steam is available other driving machinery, such as gas engines, oil engines, electric motors, or, in order to increase the safety of operation, a combination of driving units may be used.

Before the gas enters the long distance system a second cleaning for the removal of naphthalene is provided. The above mentioned conditions regarding the deposit of naphthalene in the pipe lines, and the resulting physical and chemical reactions have developed the fact that the compression to high pressures is the best method for freeing the gas completely of naphthalene, and in the simplest manner. For this enterprise a process has been developed which is based on the absorption of the naphthalene from the compressed gases at first at a high and then at gradually lower temperature by a wash oil of special composition. The necessary apparatus for this process is installed directly behind the compressor. A low cost of installation and a minimum of operating expense are the chief advantages of this process.

Following the naphthalene removal intensive cooling of the gas takes place, in order to obtain a gas not only free from naphthalene, but practically free from moisture.

Since the gas is furnished exclusively by coke plants of the most modern design its uniformity and regularity can be relied upon in a degree never before attained. Should a specific heating value or a certain specific weight be demanded, there are no difficulties in the way of meeting such specifications.

A perfect operation of a long distance gas supply system on such a large scale, with its fluctuations in consumption and the changing of the pressures in the pipe lines is possible only by close and permanent supervision. For this reason we have developed an extensive supervising system, which takes care of even the smallest details.

The daily checking of the lines for leaks is done by employees who are stationed along the line, where each one has to watch over a certain section. These stations contain at the same time equipment for the measuring of the gas pressure in the line, where the pressure is automatically recorded. In order to have communication by telephone between the individual supervising stations, a combination cable is laid simultaneously with the laying of the pipe line, some of the strands of which are used for telephone service. The other strands serve for the transmission of pressure measurements to a central supervising station. The results of all pressure measurements taken along the lines are gathered in this central station. Furthermore, all measurements made at the mines, such as hourly gas quantity, initial pressure, heating value, and density of the gas, are transmitted to this central station and automatically recorded. Though only the recorded readings taken at the mines are used as a basis for accounting, nevertheless perfect control of all the conditions in the whole network is made possible by the collection of all these operating data in one central station.

We believe technical progress has made possible the successful installation of a model long distance gas supply system. The idea of long distance gas distribution is growing rapidly all over Europe, and especially in Germany. It will not be very long until the transportation of coal gas over long distances will have found that place in energy economics which it deserves on the basis of technical and economic progress.

## PROPOSED MEMORIAL TO WILLIAM MURDOCH.

A discussion, interesting to gas engineers, has been proceeding in the columns of our contemporary, "Engineering," which always pays due attention to the gas and allied industries. The subject is a proposed memorial to William Murdoch, the inventor of gas lighting. It therefore appeals especially to the readers of the "Journal;" and, as usual, our correspondence columns are open to our readers, whom we invite freely to express their views, and particularly to offer practical suggestions as to how in their opinion the objects set forth in "Engineering" might be realized. We think that everybody will agree that something should be done without much further delay to put right what we must in charity regard as an oversight for these many years. As patriotic Britishers also we ought to see what united steps might be taken throughout the British Empire, all parts of which have materially benefited by Murdoch's epoch-making inventions, to rectify the regrettable oversight. As one of the correspondents in "Engineering" points out, Watt has many memorials, but for Murdoch one has to apply Wren's famous epitaph "si monumentum requiris, circumspice," only, in place of looking around at St. Paul's Cathedral, one must take a view of the whole world.

We give the letters in full, as each contains valuable suggestions for consideration.

To the Editor, "Engineering," Bedford Street, W.C. 2.

*From R. Angus Downie, Wishaw.*

The house occupied by William Murdoch at Redruth in Cornwall has been recently purchased by Mr. Arthur Pearse Jenkin, who intends to restore it and give it to the nation. Would this not be a suitable occasion for engineers to pay a tribute to his genius?

William Murdoch is best remembered by his invention of gas lighting. His other contributions to civilization are strangely overlooked. Yet Murdoch was the first to lay down the principles of steam locomotion. While living at Redruth, and years before Watt's famous steam engine saw the light of day, Murdoch built a carriage that was actually driven by steam. This primitive engine exists to-day.

Representatives of the gas industry have already paid tribute to Murdoch. Surely some association or society is able and willing to raise some suitable memento to the man to whom their profession owes so much.

*From R. Barclay Murdoch, 174, Aitkenhead Road, Glasgow.*

Is there not a tendency for hero-worship to be given on merely sentimental grounds? This seems to be very much the case with the subject of the letter by Mr. R. Angus Downie, for if ever there was a man whose skill and industry promoted the advancement and welfare of mankind, it was surely William Murdoch. He, however, was so unassuming as to allow himself to be obscured and deprived of the just credit and reward of his enterprise by a man who, by virtue of his position, domineered over him.

It is indisputable that William Murdoch proved that James Watt was wrong when he said "The Almighty would have to work a miracle before a steam engine could propel itself along the ground," for William Murdoch *did* make an engine that propelled itself along the ground, and that most successfully, far more so than those of either Cugnot or Symington. It was the machine that gave Trevithick the lead for the construction of his road engine, which was the direct precursor of the modern locomotive. But Watt was so jealous of, and angry with, Murdoch that he absolutely forbade him to patent either the locomotive, the slide-valve, gas lighting, or some other of his inventions and discoveries, and thus deprived him of obtaining the recognition that was his due. Is it not time that the engineers of Great Britain did something to rescue from oblivion the name and achievements of this genius, to whom they and the world at large owe so much, and for which he has been deprived of his rightful credit? I would not advocate statues or monuments to his name, but the establishment of some institution to promote and encourage the prosecution of yet further discoveries in the mechanics and science generally to which he devoted his whole life.

Permit me to add that, though I bear the same surname as William Murdoch, I am, as far as I know, in no way connected with him, but am simply one who, out of appreciation of his splendid character and remarkable genius, am an ardent admirer, and have tried for many years to obtain recognition for him.

*From Walter T. Dunn, 4, Wavertree Road, S.W. 2.*

I entirely agree with your correspondent's letter (Mr. R. Barclay Murdoch's). It should be generally agreed by engineers who appreciate the value of the epoch-making inventions of William Murdoch that some lasting and useful form of memorial is due to him—in fact, is a long time overdue.

When the cosmopolitan visitors to our national fane of Westminster Abbey view the beautifully executed windows there to the memory of Lord Kelvin, Thomas Telford, John Wolfe Barry, Benjamin Baker, and other notable engineers who have left their mark in the realms of engineering science, they cannot but wonder why one of the vacant lights has not been devoted to perpetuate the memory of a man who, as your correspondent rightly points out, is worthy to rank with his great master, the immortal James Watt, of whom there are many memorials of various descriptions. Can nothing be done now to give effect to your correspondent's most opportune suggestion?

*From Malcolm M'Ewen, 58, Tweedsmuir Road, Cardonald, Glasgow.*

With reference to Mr. Murdoch's letter, I am glad to read its contents, and agree with the sentiments. James Watt is far too much in evidence. Engineers do not take time to study history, or they would consider Watt in a far lesser degree than Murdoch, Trevithick, Hackworth, or yet Newcomen.

Watt was, as Mr. Murdoch says, inclined to be selfish and jealous. He was a "low-pressure man," and did not consider for one moment that high-pressure steam was absolutely necessary if the steam engine was to be economical as a prime mover. Hence he was antagonistic towards any other engines. Murdoch, from the beginning, was a great genius; those who know Dr. Smiles are aware of the wooden hat which he turned oval in a lathe of his own make at Cumnock, where he was born.

Engineers all over the world, especially locomotive men, ought to remember, and give Murdoch the premier place, together with Trevithick, for they solved many problems from which we are reaping benefits to-day.

# PARLIAMENTARY INTELLIGENCE.

[From Our Special Correspondents.]

## A COMMITTEE ON GAS POISONING.

In the House of Commons, on Tuesday of last week, it was announced that, without unnecessary delay, a Committee would be appointed to review the developments which have taken place since the Carbon-Monoxide Committee sat in 1921.

Mr. BOWERMAN asked the President of the Board of Trade whether his attention had been drawn to the fact that during the past fifteen years deaths due to coal gas poisoning had increased from 170 to 1142; that during this period the percentage of carbon monoxide, the chief poisonous constituent of coal gas, had been raised from 7 p.ct. to as much as 15 p.ct., and in some cases to 20 p.ct., such increase militating against the recovery of persons accidentally poisoned by gas; and whether he was prepared to give consideration to the recommendation of the Committee appointed in 1921 to the effect that, if the free-dom from l'mitation in the use of carbon monoxide was proved to be accompanied by unexpectedly unfavourable results, the attention of Parliament should again be directed to the matter.

Sir P. CUNLIFFE-LISTER replied that his attention had been directed to statistics of gas poisoning; and, more particularly since the report of the Committee on Carbon Monoxide in 1921, the situation had been carefully watched and relevant information collected When reference was made to the number of deaths due to gas poisoning, it was necessary to bear in mind how large a proportion consisted of cases of suicide. But he thought it would be desirable that a small but experienced committee should review the developments which had taken place since the Pearce Committee sat; and he proposed to appoint such a committee

Mr. W. THORNE: Does the information just given include the people who voluntarily put their heads into gas ovens; secondly, is the gas less impure now than it was when the therm system was started; and, thirdly, is the gas more impure now than it was before gas mantles were introduced?

Sir P. CUNLIFFE-LISTER: It is extraordinary what a large proportion of suicides are included in the statistics of deaths from gas poisoning. In 1927, the number of suicides was 943, and the other deaths were 150. As regards the second point, the gas is much better since the therm system was introduced, and people are now paying for gas as gas.

Mr. WESTWOOD: Will the President of the Board of Trade agree not to send to Aberdeen this advertisement of a cheap way of committing suicide.

## YORKTOWN (CAMBERLEY) AND DISTRICT GAS AND ELECTRICITY BILL.

The Bill promoted by the Yorktown (Camberley) and District Gas and Electricity Company was considered by a Select Committee of the House of Lords, over which Lord LOCH presided, on Friday, March 22. Its main purpose is to authorize the acquisition by the Company of the gas undertaking of the Wokingham Corporation. (See "JOURNAL" for Jan. 30, p. 272.) The Company were represented by Mr. F. J. Wrottesley, K.C., and Mr. Jacques Abady. There was opposition by the Frimley Urban District Council, part of whose area is supplied by the Company. The Council sought to safeguard the interests of the Company's consumers in the Frimley district, and urged that if the Company were authorized to charge a lower price in the borough of Wokingham than in the remainder of its area, as was proposed by the Bill, the period during which that differential charge should be made should be limited. The Council were represented by Mr. E. J. Rimmer.

Mr. WROTTESLEY, for the Company, said that the borough of Wokingham was situated in the centre of the Company's area of supply. In 1925 the area of the borough was extended. The Corporation supplied gas in the borough as delimited before that date, and the area which was added to the borough at that time was still supplied by the Company. Thus, the borough as delimited at present was supplied partly by the Corporation and partly by the Company. Both the Company and the Corporation had their own charging powers, and the Company were charging more for gas in the part of the borough they supplied than the Corporation charged in the other part. That difference would be eliminated if the Bill were passed.

The Corporation had an efficient works in the middle of Wokingham; and this the Company proposed to take over. The Company's works were in Frimley, at the extreme south of the area of supply, which area stretched for many miles northwards. It seemed hardly economical that the Company should be manufacturing gas at Frimley and running long mains in order to feed gas into the houses of people in the part of the borough of Wokingham at present supplied by the Company. It was from this point of view that the Company had approached the problem. The obvious advantages of linking the two works were such that the Company had decided that, if possible, the Corporation's works ought to be transferred to the Company, if terms could be arranged. It was proposed to instal a high-pressure main to connect the two works. There was spare plant at Wokingham, so that, as the demand on the Frimley Works increased, the spare plant at Wokingham could be used for manufacture, and the gas be transmitted to Frimley. In this way capital expenditure on new plant at Frimley could be postponed.

Through the medium of their technical advisers—Mr. Arthur Valon (of Messrs. W. A. Valon & Son, Westminster) for the Company, and Mr. George Evetts for the Corporation—negotiations were conducted. As a result, the Company were able to present an agreed Bill, under the terms of which they would take over the Wokingham undertaking for £35,600.

The real point in the case was whether the Company were to be permitted to take over a compact square mile within the borough at what they believed to be a fair price, having regard to the fact that they were sure they could use it in such a way as to cheapen the supply of gas throughout the whole area.

The Frimley Urban District Council, in their petition against the Bill, had raised objection first to a proposal by the Company that the price to be charged for gas within the borough was to be 1d. per therm less than that charged in the remainder of the Company's area. Counsel pointed out that it was part of the bargain with the Corporation that the Company should charge the lower price in the borough, having regard to the nature of that area as compared with the remainder of the Company's district. The Company's standard price was 15·8d. per therm. The price charged in 1928 in the Company's area was 15d. per therm, but from Jan. 1 the price charged had been 13·77d. In fixing that price, the Directors had run a little risk. So sure did they feel, however, that in the end they would make a general improvement by taking over the supply to the whole borough and by the economies that could be effected by the inter-working of the two works, that Mr. Valon had advised the Board, and they were content, to promise definitely that, if the Bill were passed, the price in the Company's area outside the borough should be no higher than 13d. for seven years, so long as costs did not rise against the Company. A provision to this effect had been included in the Bill. The result of this would be that Wokingham would be supplied at 12d. The present price at which the Corporation supplied in the part of the borough which was within their area of supply was 11·96d. The Company could not suggest that, in the interests of Frimley, a burden should be imposed upon Wokingham consumers by increasing the price of their gas substantially. As the result of amalgamation, there was bound to be a progressive fall in the price of gas in both areas, to less than 13d. and 12d. respectively.

The Frimley U.D.C. had asked that the transfer should not be allowed unless proper provision were made for the protection of the interests of the consumers in the Company's existing limits, which included an important part of the Frimley district. Counsel pointed out, however, that the petition was drafted before the clause had been added to the Bill to provide that the price outside the borough should not be higher than 13d. for seven years. As the result of that clause, the price of gas in Frimley would be reduced immediately. It was true that the price in that part of the borough at present supplied by the Company would be 12d. per therm after the amalgamation, as compared with the present higher price charged by the Company there; but he did not think the Committee would encourage the charging of two prices inside the borough. The concession had been made to those consumers within that part of the borough at present supplied by the Company because the Wokingham borough area was very compact, and surrounded by an area in which development was taking place. It was obvious that supplies could be given within the borough from the Wokingham Works much more cheaply than from the Frimley Works, and it was in recognition of this fact that the lower price would be charged within the borough.

Another point made by the Frimley Urban District Council was that, if any preferential price within the borough of Wokingham were justified, it should be limited in duration, and should not operate so as to reduce the price to be charged there by the Company below the average price charged by the Corporation during recent years. Further, it was submitted that any reduced price which might be allowed should not apply to the extended portion of the borough of Wokingham. The real point of the case, said Counsel, was a bit of municipal jealousy. The Company must stand by their bargain, and were prepared to justify it. The Wokingham consumer had an unanswerable case for a differential.

Mr. *Arthur Valon*, who gave evidence on behalf of the Company, said that the works of the Yorktown Company were in an efficient condition, and the Wokingham Works, having regard to the comparative sizes of the two works, was as well-equipped as Yorktown. Clearly the acquisition of the Wokingham Works, quite apart from the undertaking, would be of value to the Company. In view of its position, its acquisition would greatly simplify the supply to the area,

In the extended part of the borough, at present supplied by the Company, there would be in the future a good deal of increase, and this would be very much more easily supplied from the Wokingham Works than from the Yorktown Works. Distribution costs were lower in Wokingham than in the Company's area, owing to the compactness of the former area. The consumption per mile of main within the Wokingham area was about 6 million c.ft., as compared with about 2 millions in the rest of the area.

If the amalgamation were not authorized, he saw no prospect whatever of the Yorktown Company supplying in the near future at a price lower than 13·77d., unless it arose from a very materially reduced price of coal. It would be unfair to the Wokingham consumers if the Company could not supply them at 1s. after the amalgamation. The proposal to reduce the price to 13d. within the Frimley area was generous to Frimley. The only people who were to be commiserated with in any way were the Company, because they were really giving all the immediate prospects of increased profits to Frimley by reducing the price to 13d. He saw no possibility of the price charged by the Wokingham Corporation being higher than 12d. if there were no amalgamation. On the contrary, there was a distinct possibility that the Wokingham price might be reduced below 12d., if the undertaking there remained in the hands of the Corporation; but this would apply only to the part of the borough at present supplied by the Corporation. In his view, the amalgamation would confer an advantage all round. From an engineering point of view it was sound, and from a commercial point of view it was sound, except that the Company were taking a risk in limiting the price.

Cross-examined by Mr. Rimmer, Mr. Valon did not agree with the suggestion that the Frimley Urban District was as compact as the Wokingham area. One could not compare the Frimley area with the Wokingham area. Parliament had decided that the whole of the Company's present area should be supplied without a differential; and the Company could not go back on this. Frimley could not be considered alone.

Mr. Rimmer said he gathered that no point was made that there was any case to be established for the consumers in the urban area of Frimley paying more for gas than those in Wokingham, except that the former happened to be in the larger area.

*Witness* said that they happened to be in the Company's existing area, in which Parliament had not authorized the Company to charge a differential.

Counsel observed that it would have been open for the present Bill to have provided for differentials in Frimley, or to say that the rate in Frimley was to be the same as in Wokingham.

*Witness* replied that, as the Company had been bound for so long to supply the whole of their area at the same price, he could not imagine that it would have been practical politics to differentiate now.

Counsel, dealing with distribution costs, said that those of the Yorktown Company were less than those of the Wokingham Corporation last year.

*Witness* pointed out that the charge for repairs to mains of the Yorktown Company were abnormally low last year.

Counsel challenged the statement that the costs of manufacture in Wokingham were less than the costs of manufacture in Yorktown, and asked whether, if he could show that the true costs of manufacture would enable the Yorktown Company to supply gas now at 11d., this would influence the Company's views.

*Witness:* Any gentleman who could do this had better be employed as engineer to the Company at once.

Counsel said that the Yorktown Company could be supplying gas now, and could have done for the last two years, at a lower price than that charged by Wokingham, but they had for their own purposes brought into revenue account capital charges. He suggested that the figure for repairs and maintenance of works and plant and mains and services in 1927 was higher than that of any other gas undertaking in the country. The figure was 6·82d. per therm, as compared with 2·48d. in Wokingham.

*Witness* said he would agree that the maintenance charges were high in Yorktown in 1927.

Counsel said that, therefore, if for their own purposes the Yorktown Company were carrying capital charges to revenue account, they were in fact producing gas at as little cost as the Wokingham Corporation; the difference being 4·34d. to deduct from the cost as shown by the revenue account.

*Witness* replied that the figure of 4·34d. was a pure estimate on the average obtained from other undertakings, and he did not admit the figure at all.

Counsel, however, said it was an actual figure. He pointed out that the selling price of the Company's gas had been charged with ½d. per therm to pay dividends on the electricity capital.

*Witness* replied that this was not so, and that last year the average return on the electricity to capital expended was the same as on the gas. It was true that the Company had started to supply electricity late. While they were working up that undertaking, there was no doubt that they were paying dividend on the electricity capital out of the gas profits; but that had righted itself now..

Re-examined with regard to costs, Mr. Valon said that in the years from 1924 onwards the Wokingham costs had been lower than those of Yorktown except in one instance, when they were fractionally higher. Also, if one eliminated the abnormal year to which Mr. Rimmer had referred, the amounts spent by Yorktown on repairs and maintenance of works and mains were not abnormal.

This completed the case for the Company.

Mr. Rimmer, addressing the Committee, said that the Wokingham Corporation were to sell their undertaking for £35,600, but they were always to receive advantages as if they had not sold it; they were still to have the alleged advantages which they now had of obtaining gas at 1d. less than the price charged in the surrounding djstricts. This proposition was an extraordinary one. The fact that the consumers in the borough—not only that part which was supplied at present by the Corporation, but also in that portion now supplied by the Company—were to pay 1d. per therm less than the consumers in the remainder of the Company's area meant that they would get a rebate of about £1000 a year (based on the quantity of gas consumed in the borough). This rebate and the purchase price of the Corporation's undertaking were to be paid by the consumers in the Yorktown area. The result of this would be to keep the price of gas in the Yorktown area at a higher level than it would be if there were no differential and if this large capital expenditure were not incurred. If the proposal were that the differential should exist for seven years, one could approach the matter in a different way; but it was to be a differential in perpetuity. The consumption within the Frimley area was as great as that within Wokingham, and the two areas were similar, so that there could be no basis for a differential price as between the two areas.

With regard to the clause in which it was stated that the price in the Yorktown area, outside the borough of Wokingham, would not be more than 13d. per therm for seven years, he said it only applied "unless the costs and charges of and incidental to the production and supply of gas by the Company have increased above those obtaining on Dec. 31, 1928, owing to circumstances beyond the control of, or which could not reasonably have been avoided by, the Company." He submitted that costs of production never increased in a well-run concern except in circumstances beyond the control of, or which could not reasonably have been avoided by, the Company. The Company were simply saying that they would reduce the price to 13d. if their costs did not go up.

Mr. Abady (for the Company) pointed out that this was a provision taken from the Gas Regulation Act, which specifically recognized that costs might go up owing to circumstances which the Directors could avoid, or owing to circumstances which they could not avoid. This allowed for the usual revision of price if warranted by circumstances beyond their control, or which could not reasonably have been avoided.

Mr. Rimmer said that the Yorktown area would get the benefit of a reduction of price if the Company were administered efficiently, as he believed it would be, without the necessity for this Bill, and without the necessity for the Wokingham undertaking being taken over. There would be a reduction of price because the works of the Yorktown Company were now so good that the Company could not go on spending moneys out of revenue for capital purposes, and, therefore, they would be obliged to give the benefit to the consumers, who in the past had made the sacrifices for these works to be improved. If the Bill were passed, the consumers in Frimley, who had enabled the Company to build their works and to get them into good condition, so as to be able without capital expenditure to produce gas at a cheaper cost, would not get the benefit of what they had done in the past. Instead of the Frimley consumers getting the benefits, they were to give them to Wokingham consumers. Wokingham were not entitled to have the £35,600 purchase money to spend on their own ratepayers, and at the same time to have a differential of 1d., which was said to be the present differential for consumers who were ratepayers in the borough of Wokingham. In addition, they were taking out of the Yorktown area a part of the borough of Wokingham, and they were going to give the consumers in that particular part of the present Yorktown area the advantage of the differential. Nothing could justify this.

Mr. *W. M. Carr* (who was advising the Frimley Urban District Council) gave evidence, and expressed the view that the purchase price of £35,600 was very high, having regard to the fact that the total capital expenditure on the Wokingham undertaking was approximately £18,500, and also having regard to the fact that the sum which the Yorktown Company would have to pay included compensation to officials, which was the equivalent of about £5000, and the value of stocks, which was £1261, making a total of £42,000. The accounts showed that no loans had been raised by the Wokingham Corporation in respect of their gas undertaking since 1916, when the annual make of gas was 27 million c.ft. The annual make for the year ended March, 1928, was in excess of 50 million c.ft. From this it appeared to be clear that the undertaking must have reached the stage when further capital expenditure must be necessary. All loans at March 31, 1928, had been paid off, with the exception of £1783.

Assuming 7 p.ct. as the figure for interest and sinking fund, the sum required in respect of the £42,000 would be £2940, which was equivalent to 3·3d. per therm on the gas sold by the Wokingham undertaking.

With regard to the clause proposed by the Yorktown Company to limit the price to 13d. per therm outside the borough of Wokingham, he submitted that the first part was nullified by the proviso. In his opinion the variations in the cost charges which were beyond the control of the undertaking were variations which altered the price of gas in every undertaking. No gas undertaking increased its price unless by reason of the variation of the costs of manufacture beyond its control.

By reason of the fact that the Yorktown Company had practically an entirely new plant, and by reason of the fact that the undertaking was more than four times the size of the Wokingham undertaking, there was no reason why they should not sell gas cheaper than Wokingham in the future, if the undertakings remained separate. They had done so before the war, and there was no reason why they should not do so now.

The balance-sheets of the Company disclosed no capital expenditure since 1925; and he concluded that the work done since that time had been paid for out of revenue. A considerable amount of this work represented extensions. He handed in tables showing the details of the Company's costs, and indicated that in 1927 the Company's expenditure on repairs and renewals was abnormal. Too much had been charged to revenue account. The figure for 1928 was also high. Instead of charging capital costs to revenue account, the Company could have reduced the price of gas during the past two years. There should certainly be a reduction in the Yorktown area now that all the renewals and extensions had been practically completed; and the consumers, who had provided the money out of revenue, and not the shareholders, ought to have the benefit of the new works.

On the true comparison of the costs of production in Wokingham and Yorktown, the cost in Yorktown was lower than in Wokingham. The differential rate proposed between the prices of gas in the two districts was not justified from his investigation of the costs.

Mr. JACQUES ABADY, cross-examining, asked if witness would agree that the published figures showed that it cost more to manufacture and distribute gas in Yorktown than in Wokingham.

*Witness* said that, in so far as the repairs of works and mains were concerned, he agreed, but, generally speaking, in other directions he did not.

COUNSEL, dealing with the suggestion that revenue had been applied to capital purposes, said that the Yorktown gas capital at the end of 1923 was £92,000, and at the end of 1928 it was £158,000, which showed that there had been spent out of capital, on capital extensions, a sum of £66,000 in five years.

*Witness* replied that this was practically all on mains and distribution plant, and not on works.

Replying to further questions, he said he had not inspected the Wokingham Works, but on paper value he considered the price to be paid for them was very high.

Mr. ABADY, addressing the Committee, said that Wokingham had a sound undertaking, practically free from debt, and the Corporation had taken the view that the consumers would get a lower price, if supplied by the Corporation—projected so far as one could see—than they could get if they came into the Yorktown area. Accordingly, as part of the bargain it was arranged that there should be a perpetual difference in Wokingham as compared with the rest of the area, not commensurate with the present difference in the charge to the consumers—which was greater—but commensurate with what it was considered would be the general cost in the future of the respective supplies if they continued separately in the hands of the Company and the Corporation. The difference in the price charged in the two areas in 1928 was 3d., and in 1929 it had been reduced to a difference of 1⅞d. He submitted that to the consumers in Wokingham it was a fair bargain. Unless it could be shown—and it had not been shown—that the differential was being given by supplying gas at less than what it would cost, it was utterly fallacious to say that the Frimley consumers would have to pay for the differential in Wokingham.

After conferring in private, the Committee found the preamble of the Bill proved.

## ROYAL VICTORIA DOCKS APPROACHES BILL.

### Protection for the Gas Light and Coke Company.

In a Bill to empower the London County Council and the Borough of West Ham to carry out works for the improvement of the approaches to docks of the Port of London Authority, there is a clause to enable either of them to acquire a bridge of the Gas Light and Coke Company, carrying mains over the River Lea, but the Authority are not to remove the bridge and mains until mains of equal capacity are substituted to the reasonable satisfaction of the Company. (See "JOURNAL" for Jan. 16, p. 159.)

The Gas Company petitioned against the Bill, and a clause has, as a result, been inserted giving the Company rights of access to roads approaching the bridge after those roads have been closed to traffic.

The clause provides that, as from the date of stopping up, under the powers of the Bill, any part of the East India Dock Road or the Barking Road, the Company shall be entitled (until the bridge is demolished), by their officers, workmen, and servants, whether with or without vehicles, to pass over the roads so stopped up, for the purpose of obtaining access to and from the bridge. The Company are also given the right of access to the roads for the purpose of inspecting, maintaining, repairing, or renewing their existing apparatus, or placing new or additional apparatus therein, and for these purposes to open and break up the roads, subject to the provisions of the Gas-Works (Clauses) Act, 1847.

## NEWCASTLE AND GATESHEAD GAS BILL.

The Bill promoted by the Newcastle-on-Tyne and Gateshead Gas Company, by which it is proposed to apply to the Company the basic price and basic dividend system (see "JOURNAL" for Jan. 9, p. 93), was to have been considered by a Select Committee of the House of Commons on Monday, March 25. We are informed, however, that, though there were over twenty petitions against the Bill originally, these have been withdrawn, and the Bill will be dealt with by the Unopposed Bills Committee of the House of Commons in due course.

# REGISTER OF PATENTS.

## Gasholder Packing.—No. 301,016.

MASCHINENFABRIK AUGSBURG-NURNBERG A.G., of Nuremberg.

No. 22,193; July 31, 1928. Convention date, Nov. 23, 1927.

This invention relates to telescopic holders, and concerns a new method of fluid-tight packing of the individual telescope rings in relation to one another.

The new packing consists in filling the space between the sheet-metal cylinders of the individual telescope rings, to a portion of its height, with a viscous-plastic mass, which serves both for packing purposes and for diminishing the friction when movement occurs. Lubricating grease is particularly suitable for this, as it is already in frequent use for technical purposes. When the telescope rings of the holder move relatively to one another, the packing mass sticks fast to the sheet-metal cylinders and constitutes a good packing. As compared with the liquid packing already proposed, there is the advantage, say the patentees, that no flowing of the packing medium down the walls of the holder is to be anticipated, and that special packing bodies sliding on the sheet-metal walls are unnecessary.

## Low-Temperature Carbonization.—No. 306,435.

SOUTH METROPOLITAN GAS COMPANY, EVANS, E. V., and STANIER, H., all of 709, Old Kent Road, S.E. 15.

No. 31,140; Nov. 19, 1927.

This invention is based on the discovery that when the hydrocarbon vapours which are produced in the low-temperature carbonization of coal are heated in presence of hydrogen before they have had time to condense—that is to say, without sensible drop of temperature—the products obtained differ essentially from those which are obtained by volatilizing the hydrocarbons after they have condensed, and heating the vapours in presence of hydrogen. The chief difference is manifested by the greater yield of therms in the form of gas produced from what may be called the still nascent hydrocarbons, than is obtainable from the re-volatilized hydrocarbons of like therm value.

According to the invention, the vapours produced by the low-temperature carbonization of any kind of coal are mixed as soon as is practicable after their production, and without sensible diminution of their temperature, with hydrogen, or a gas containing hydrogen, and the mixture, again without cooling, is subjected to a high temperature—for example, above 700° C.—in presence or absence of contact material such as firebrick.

By this process, state the patentees, it is possible to use low-temperature carbonization in the gas-works without serious diminution of the output and calorific value of the gas, or greatly varying the nature of the oils condensed, as compared with the present practice of high-temperature carbonization.

The method of procedure is as follows: A coal suitable for low-temperature carbonization in a retort of appropriate design is carbonized at a low temperature (say, 600°—650° C.). During the carbonization, water gas from a generator is admitted to the base of the retort, whence it passes through the coal charge. The retort communicates at its upper portion with a cracking chamber heated to a temperature of about 700°—800° C. into which the low-temperature tar vapours and gaseous products, diluted with the added water gas, pass without intermediate cooling. The treated gases issue to the hydraulic main and condenser, to be passed through the scrubbers and purifying boxes for storage or distribution.

The yield and calorific value of the gas obtained will depend on the quantity of water gas used. Thus, using a good gas-making coal such as might give on straight carbonization at high temperatures in horizontal retorts about 70 to 73 therms of 560 B.Th.U. gas per ton, and adding about 7000 to 8000 c.ft. of water gas per ton at such a rate during the carbonization as to maintain a more or less uniform concentration of hydrogen in the final gas, about 75 to 80 therms of gas of approximately 560 B.Th.U. (inclusive of the water gas added) may be obtained per ton of coal. In effect, the process is one for carburetting water gas with the rich hydrocarbon gases produced by decomposition, in the presence of the hydrogen contained in water gas, of the gaseous products and vapours originating from the carbonization of the coal at low temperatures. The coke obtained is a low-temperature product, rich in volatile matter and easily ignited; while the tar is of approximately similar character to that obtained in normal high-temperature processes of carbonization.

Instead of working the generators as in the previous example to give a good water gas, they may be worked at a lowered temperature so as to give a mixture containing hydrogen and carbon monoxide in any desired proportions, and the carbon dioxide which is produced simultaneously may be removed either before admitting the gas into the low-temperature retort, or from the final gas after completion of the process.

The gas to be added during the process may also be obtained by the carbonization at a high temperature, with or without steaming, of the whole or part of the low-temperature coke produced in a previous carbonization, and mixed, if necessary, with a suitable proportion of other gas containing hydrogen.

## Burners for Irons, &c.—No. 306,646.

KEITH & BLACKMAN CO., LTD., and KEITH, G., both of Farringdon Avenue, E.C. 4.

No. 33,978; Dec. 15, 1927.

This invention has for its primary object to provide a construction in which the adjustment of the regulator when set for the optimum mixture is practically constant in the hot, cold, and intermediate conditions of the burner. A further object is to avoid liability to obstruction of the air entrance by fluff, such as may be experienced where the air entrance is merely strangled by a shutter. Another object is to effect more intimate admixture of the combustible and combustion-supporting constituents.

The chief claim is for a gas burner comprising a mixing chamber

or tube having at one end a gas injector nipple and an atmospheric air inlet, and open at its other end to a heating chamber provided with a port or passage whereby part of the mixture of gas and air in the heating chamber may be withdrawn from the heating chamber and re-introduced to the inlet end of the mixing chamber, and adjustable means for regulating the proportions of returned mixture and atmospheric air induced to enter the mixing chamber.

The adjustable means comprises an element rotatable to vary the opening from the port or passage into the inlet end of the mixing chamber or tube.

The design of the burner and mixing chamber is described in detail, illustrated, and claimed *in toto* accordingly.

## Gasholders.—No. 306,716.

WATERLESS GASHOLDER COMPANY, LTD., of Rood Lane, E.C. 3, and GADD, A., Manchester.

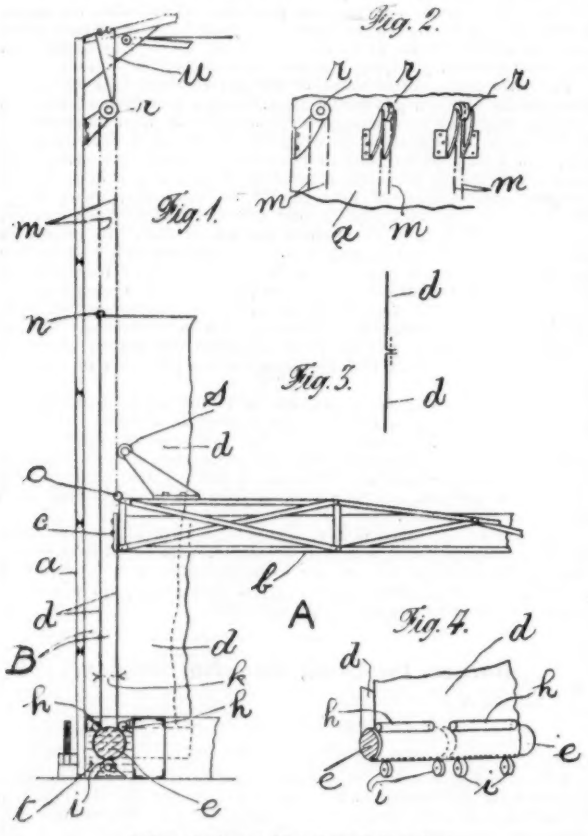
No. 6676; March 3, 1928. No. 16,963; June 12, 1928.

This invention is for a gasholder of which the sides are of a flexible nature. The sides, however, are such that the gas-containing part retains its normal shape at all heights, or approximately so (thus enabling a shallow seal to be sufficient). The sides are not in frictional contact with the shell, but guiding means, such as rollers supported by the shell, may exist for supporting the flexible sides named.

The sealing means may be such that the liquid therein tends to maintain the flexible material as to gas-tightness during rising and falling of the lift concerned. The flexible sides are in sleeve form all round the holder area and pass about a series of rollers.

The loop of flexible material in some cases passes through the shallow seal situated at the lower part of the holder. For small holders, or when the bursting pressure due to inequality of pressure on opposite sides of the fabric used is not excessive, the position of the seal as stated may suffice. But in the case of large holders, means for providing an equality of pressure as far as practicable may be necessary. This can be attained by providing the shallow seal mentioned at the upper part of the holder or shell, and by so arranging the rollers that the seal occurs externally of the flexible sleeve. In this case, the flexible material to a large extent may have gas on both sides thereof, the escape of gas between the shell and the flexible sleeve device at the top being prevented by the seal. This latter arrangement is also capable of useful application to existing standard holders with tanks; the water in the latter being dispensed with.

Fig. 1 is a sectional elevation of a portion of a gasholder shell. Fig. 2 is a perspective view of a portion of the upper part of fig. 1. Fig. 3 has reference to the jointing together of the flexible material of which the flexible sleeve of the holder is composed. Fig. 4 is a perspective view of a detail at the lower part of fig. 1.




A New Design of Waterless Holder Seal.

The piston is shown at *c* to be firmly attached, in gas-tight manner, to a flexible sleeve of material shown at *d*. This sleeve passes around a series of rollers, the clearance between rollers being sufficient to allow of slight change of angulation of the rollers as they extend all round the loop of the material *d* in manner indicated. It will be seen that the rollers *e* cannot be externally supported like ordinary pulleys or wheels; and it is assumed in fig. 1 that they are of considerable weight for preventing the loop of the material *d* rising as the holder is inflated with gas, or the piston *b* rises. Check rollers are indicated at *h*, the diameter of the rollers *e* being slightly greater than the distance marked *k* between the sheeting or material. A roller arrangement at *i* also helps to support the rollers. Chains or flexible steel ropes or the like are indicated at *m*, connected at one end in each case to the holder sleeve at points such as *n*, at the edge parts of the sleeve *d*, and at the other end to points *o* at some convenient part of the piston *b* or the material forming *d*. These chains are supported by chain pulleys *r* on brackets projecting from the shell *a*, and the same may be used as guides for the steadying pulleys for the piston *b*; such pulleys being arranged as indicated at *s*.

The shell *a* being a rigid body, more or less, wind pressure does not come upon the piston *b*, so that oscillation of the same during rise and fall is not likely to occur, especially having regard to the slow motion involved.

The rollers *e* are submerged in a continuous seal at *t*. As the piston reaches its uppermost position, the rollers *s* may pass on to plates or supports *u* attached to the crown of the shell *a* or as suitable.

In order to provide gas and therefore uniform gas pressure on both sides of the sleeve *d*, and so reduce the bursting tension upon the material, the seal *t*, or one equivalent to it, is transferred from the lower part of the holder to the upper part, and thus necessitates a re-arrangement of the roller system, but without altering the fact that the flexible sleeve passes about said rollers after the manner of belting about pulleys.

The remainder of the specification deals with the last-mentioned arrangement, and with the application of the invention to framed water-tank holders, which is fully explained and illustrated by drawings.

## Controllers.—No. 307,176.

METROPOLITAN GAS METERS, LTD., and FORSTER, J. D., both of Nottingham.

No. 3455; Feb. 3, 1928.

This invention relates to improvements in the gas controller of Patent No. 107,392, in which a pair of independent lift valves controlling the supply of gas to independent burners or groups of burners are adapted to be opened and closed consecutively by opposite movements of a rocking lever controlled by tappet arms operated by clockwork, which lever is held in any of three positions by one end thereof engaging a spring trip lever; the two extreme positions, determined by cam surfaces on the trip lever, corresponding respectively to the closed and open positions of both valves, while the intermediate position, determined by a recess between the cam surfaces, corresponds to the open position of one valve only.

The object of the invention is to adapt such a controller so that both burners or groups of burners may be lighted simultaneously. To this end, in place of a pair of tappet arms for opening the two lift valves, a single tappet arm only is employed, and so constructed that in its movement by the clock mechanism it throws over the rocking lever from one extreme of its movement to the other extreme thereof, without any intermediate dwell due to engagement of the rocking lever with the recess between the cam surfaces on the trip lever.

In a suitable arrangement, the single tappet lever has pivoted thereon an auxiliary tappet arm also designed to co-act with the rocking arm and controlled by a spring in such a manner that the spring tappet arm, when brought into contact with the rocking arm, is moved against the pressure of its spring until the single tappet arm, co-acting also with the rocking arm, disengages the latter from one of the cam surfaces of the trip lever; thus allowing the spring tappet arm to be moved by its spring past the recess in the trip lever and into engagement with the other cam surface of the trip lever.

An anti-friction roller is advantageously employed on the rocking lever to co-act with the trip lever.

## APPLICATIONS FOR PATENTS.

**[Extracted from the "Official Journal" for March 27.]**

Nos. 8624—9472.

ABBOTT, A. V.—"Process for low-temperature distillation of bituminous coal." No. 8712.

ADAM, W. G.—"Production of sulphate of ammonia." No. 9050.

ARMITAGE, T. B.—"Means for disposal of waste water from geysers." No. 8797.

BABCOCK & WILCOX, LTD.—"Coal distillation, &c., plant." No. 9424.

BABCOCK & WILCOX, LTD.—"Quenching coke." No. 9427.

BABCOCK & WILCOX, LTD.—"Retorts." No. 9429.

GAS LIGHT AND COKE COMPANY.—See Adam, W. G. No. 9050.

HELPS, A. M.—"Gas-fired boilers." No. 9090.

HOLTAM, A. G.—See Armitage, T. B. No. 8797.

IMPERIAL CHEMICAL INDUSTRIES, LTD.—"Cooling coke." No. 9408.

MURDOCH, D. G.—See Adam, W. G. No. 9050.

RILEY, W. A.—See Babcock & Wilcox, Ltd. Nos. 9424, 9427, and 9429.

SMITH, E. W.—"Dry gas meters." No. 9048.

SMITH METERS, LTD.—See Smith, E. W. No. 9048.

TYRER, D.—See Imperial Chemical Industries, Ltd. No. 9408.

WEEKS, E. G.—See Babcock & Wilcox, Ltd. Nos. 9424, 9427, and 9429.

# MISCELLANEOUS NEWS.

## FELIXSTOWE GAS LIGHT COMPANY.

### Transfer to the Ipswich Gas Light Company.

An Extraordinary Meeting of the Felixstowe Gas Light Company was held at the Offices of the Company, Hamilton Road, Felixstowe, on Wednesday, March 27, for the purpose of approving an agreement for the transfer of the Company's undertaking to the Ipswich Gas Light Company as from July 1 next, such agreement providing for the sale of the Felixstowe gas undertaking and the taking-over of the capital stocks of the Company with all assets and liabilities, and for compensation to the Directors. Mr. E. H. Woodman presided.

The Chairman explained that in January last the terms of a proposed agreement for the purchase by the Ipswich Company of the Felixstowe undertaking was circulated among the stockholders, and this was confirmed by a meeting of the stockholders on Feb. 4. The terms of this agreement, however, were not acceptable to the stockholders of the Ipswich Company, and another agreement had now been entered into for the purchase of the Felixstowe undertaking, subject to similar terms and conditions as were contained in the original agreement, but with the following exception: That *in lieu* of any cash payment to the holders of the "A" and "B" ordinary stocks of the Felixstowe Company, an issue of a corresponding amount of 5 p.ct. redeemable stock of the Ipswich Company will be made to them, such stock to be redeemable by the Felixstowe stockholders at six months' notice. The Directors of the Felixstowe Company considered that the terms of the new agreement were not less favourable to the stockholders than those contained in the original agreement, and therefore recommended them to the stockholders for approval. He moved:

> That the provisional agreement entered into with the Ipswich Gas Light Company for the sale of the undertaking of the Felixstowe Gas Light Company upon the terms of such agreement be approved and confirmed, subject to such modifications as to details, and not affecting the value of the consideration to be paid, as may be agreed by the Directors.

Mr. A. J. Haward seconded.

Arising out of some discussion as to when the agreement would become operative, the Secretary (Mr. F. M. Paternoster) read certain clauses of the new agreement, which stated that the agreement would be subject to the sanction of the Board of Trade on the application of the Ipswich Company. He explained that until such time as the agreement became effective the Directors of the Felixstowe Company would continue their administration of the concern.

The motion was adopted.

## RAPID PRIVATE BILL PROGRESS.

The following "time-table" of the passage through Parliament of the Sheffield Gas (Consolidation) Bill, 1929, is interesting as showing the rapidity with which Parliament can deal with Private Bills. At the same time, it should be pointed out that this Bill is not unique, because two other Private Bills lodged in Parliament last December also received Royal Assent on the same day, and many others are well on their way to it.

Sheffield Gas (Consolidation) Bill, 1929—Progress in Parliament.

| | | |
|---|---|---|
| 1928. | | |
| Dec. | 13 | Bill deposited in Parliament. |
| 1929. | | |
| Jan. | 18 | Proofs given of compliance with Parliamentary Standing Orders. |
| ,, | 23 | Meeting to allocate Private Bills between the two Houses of Parliament. Bill allocated to House of Lords. |
| ,, | 24 | First reading—House of Lords. |
| Feb. | 5 | Proof given of approval of Bill at Wharncliffe Meeting. |
| ,, | 7 | Second reading—House of Lords. |
| ,, | 19 | Period for lodging petitions against Bill expired. Bill unopposed and committed to Joint Committee on Private Consolidation Bills. |
| ,, | 20 | Bill considered by Joint Committee. |
| ,, | 21 | Formalities of Committee stage completed. Draft special report circulated to Members of Joint Committee. |
| ,, | 27 | Draft special report approved. Bill reported. |
| Mar. | 6 | Third reading—House of Lords.<br>First reading—House of Commons. |
| ,, | 12 | Proofs given of compliance with Second House Standing Orders. |
| ,, | 18 | Second reading—House of Commons. Committee stage waived, and Bill ordered to lie on Table of the House. |
| ,, | 21 | Consideration stage—House of Commons. No amendments made. |
| ,, | 25 | Third reading—House of Commons. |
| ,, | 27 | Royal Assent. |

## BRITISH GAS LIGHT COMPANY, LTD.

### Annual General Meeting.

The Annual General Meeting of the Company was held on Wednesday, March 27, at the London Offices, No. 2, The Abbey Garden, Westminster, S.W. 1—Mr. Henry Woodall, M.Inst.C.E. (the Chairman and Managing Director of the Company), presiding.

The Secretary (Mr. A. J. Mumford) read the notice convening the meeting and the Auditors' reports; and the report of the Directors and the statement of accounts for the half-year ended Dec. 31 were taken as read.

The Chairman, in moving the adoption of the report and accounts, said: As you know, we have hitherto held our annual general meetings in September. This is the first to be held in March, and, consequently, although an annual meeting according to the Act, we are dealing with the accounts for six months only. The Board of Trade have given their approval to the alteration in so far as they are concerned, and our financial year in future will end in December, instead of June. You will realize that this will bring us into line with most other gas concerns, and has several other advantages from the accountancy standpoint. The period under review—namely, from July 1 to Dec. 31, 1928—was not a good one from a gas point of view. The accounts for the period, however, show a profit of £30,902, and this allows us to pay the usual dividend, to add £2205 to our reserves, and to increase the carry forward by £1752. The total carry forward now stands at the substantial figure of £84,120.

A better showing could have been made had we taken into account the accrued profits of the subsidiary undertakings. We decided not to do this, but to include only such dividends as have been actually paid. The figures for the subsidiary companies are now before us, and are, I am glad to say, quite satisfactory. As I stated before, while we continue to acquire undertakings, our expenses, in order to bring them up to our standard, are in the early years somewhat heavy; but each added undertaking increases the stability of the whole. All our works (which I have recently visited) are in excellent condition.

From the report you will see that we have issued £75,000 Hull mortgage debentures at 5¼ p.ct. This was to provide for extensions at the Hull Station. We have further just arranged, on behalf of the Parent Company, an issue of £250,000 5 p.ct. redeemable debenture stock at 93¾ p.ct., the cost of the money to us being just over 5½ p.ct. A large portion of the issue is required to pay for recent acquisitions.

One other matter I must refer to—namely, the resignation of our valued colleague and friend, General Corrie. The General was a Director for 35 years; but at his advanced age of 90 he felt no longer able to keep up his regular attendance at our meetings, and so, to our great regret, he resigned his Directorship. In his place we elected our Secretary, Mr. A. W. Brookes. Mr. Brookes, as you all know, has served the Company most faithfully and well for over 50 years. Your Directors are, as I am sure the stockholders will be, delighted to have Mr. Brookes on the Board, and to know that they will still have the advantage of his great experience. Mr. Brookes' duties will naturally be lightened, and, in consequence, we may expect that he will for a long time still be able to give us the benefit of his unrivalled knowledge of our unique undertaking.

The Deputy-Chairman (Mr. Harold G. Palmer) seconded the motion for the adoption of the report and accounts, and it was unanimously agreed to without discussion.

On the proposition of the Chairman, seconded by Mr. Graham Wilkin, it was resolved:

> "That the payment by the Directors of the half-year's dividend at the rate of 7 p.ct. per annum, *less* income-tax, on the cumulative preference stock of the Company, as mentioned in their report of March 11, be confirmed.
>
> "That a dividend on the ordinary stock at the rate of 3¾ p.ct., *less* income-tax, be now declared, the same to be payable on April 5 next; and that the dividend warrants be sent by post to the last known address of each proprietor, unless instructions have been received to the contrary."

The Chairman proposed the re-election as a Director of the Hon. Clive Bigham, who, he said, had been on the Board now for some years, where he rendered valuable service.

The Deputy-Chairman seconded this, and it was agreed to.

The Chairman then proposed the re-election as a Director of Mr. A. W. Brookes. He remarked that they all knew Mr. Brookes, and hoped that he might for many years continue to be a member of the Board. ["Hear, hear."]

The Deputy-Chairman seconded the proposition, which was agreed to.

Mr. Brookes, returning thanks, said that at the last general meeting he had told the proprietors how handsomely the Company had treated him on his completion of 50 years' service. Since then they had honoured him by electing him a Director temporarily, in place of General Corrie. Further than this, on his retirement from the Secretaryship the Board had granted him a very substantial allowance. His thanks were now due to the proprietors for having endorsed the action of the Directors in appointing him to the Board.

The Auditors (Messrs. E. Knowles Corrie and William Cash, Jun.,

F.C.A.) were re-appointed, on the motion of Mr. G. HAY MORGAN, K.C., B.Sc., seconded by Mr. KENNETH R. MACKAY.

Mr. W. A. SURRIDGE proposed a hearty vote of thanks to the Chairman and Directors for their services. He said that the continued prosperity of the Company was the best testimony to the value of these services. It was obvious that the responsibilities of the Board were becoming greater with the acquisition of subsidiary undertakings. Shareholders who, like himself, had known Mr. Brookes for many years were delighted to see him on the Board, and offered him their cordial congratulations.

Mr. F. R. W. SLY seconded the proposition, which was enthusiastically carried.

The CHAIRMAN, returning thanks, said the Directors were fortunate in having an excellent staff. Although they had lost their leading official, who had helped and guided them for so long, he had not left them without anybody to follow in his footsteps. A good Secretary, such as Mr. Brookes, obtained good assistants; and the Directors felt satisfied that the assistants Mr. Brookes had had, one of whom, in Mr. Mumford, was taking his place as Secretary, were imbued with the same spirit that imbued Mr. Brookes. They had knowledge of the admirable manner in which Mr. Brookes had carried out his duties, and they would perform theirs in the same way. They were happy in having distinguished managers at their works, which were extremely well conducted in every way. The workmen were satisfied, and were highly appreciative of what was done for them. The Company were improving the club-rooms and sports grounds, and on their centenary they had started a non-contributory pension fund. It was a great comfort to the men to feel that they had something to look to when they had finished their working life. Mr. John Young, who was their Manager first at the Potteries, then at Norwich, and eventually at Hull, had informed him that when going through the streets he often met old pensioners, who told him how delighted they were with the treatment that had been meted out to them by the Company. He concluded by proposing a vote of thanks to the officers, staff, and employees.

Mr. BROOKES seconded the proposal, which was unanimously passed, and acknowledged by Mr. Mumford, who said that one and all were proud to serve the Company, and in their work were assisted in no small measure by the consideration and encouragement which they received from the Board.

# GAS COMPANIES' RESULTS IN 1928.

## Growth in Sales Well Maintained.

### EXMOUTH.

In a review of the past year's business at the Annual Meeting on Monday, March 25, of the Exmouth Gas Company, the Chairman, Mr. E. T. Linscott, said that in the few years he had been a member of the Board of Directors the output of gas had nearly doubled, and was now approaching 140 million c.ft. per annum. This was a big increase, and was due in no small measure to the development of the town and the efforts the Directors had made to fulfil their statutory duty and to cope with that development. This expansion in the sales of gas had compelled the Directors to ask the stockholders to empower the Board to raise an additional £35,000 of capital, so that they might add to their manufacturing plant and also provide what was of vital importance, more storage capacity. Another branch of the business which showed continual progress was that done in gas fittings and appliances through the showroom, and to cope with this better, and to show the goods to greater advantage, as well as to afford increased storage accommodation for the stock, the Board had just placed a contract for considerable alterations and improvements. The Directors recommended a dividend of 7½ p.ct., *less* tax, on the consolidated ordinary stock, the same as last year. The sales of gas were stated to show an increase of upwards of 4½ million c.ft., or 21,912 therms, over 1927; the increase being equal to 3·6 p.ct.

### HORLEY.

A satisfactory state of affairs was reported upon at the Ordinary General Meeting of the proprietors of the Horley District Gas Company held at the Cannon Street Hotel, London, on March 12; Mr. J. W. Stevens, the Chairman, presiding. In their report for the half-year ended Dec. 31 last, the Directors stated that the sale of gas showed a satisfactory increase of over 1¾ million c.ft. as compared with the corresponding period of last year. The profit and loss account showed an available balance of £5534, after providing for the fixed charges for interest, and the Directors' recommended payment of dividends at the rate of 5 p.ct. per annum on the preference stock, 12 p.ct. per annum on the "A" capital stock, and 9 p.ct. per annum on the additional "B" capital stock, all *less* income-tax, which would absorb the sum of £2583, leaving a balance to be carried forward of £2951. The price of gas had been substantially reduced as from the commencement of the half-year under review. In moving the adoption of the report and statement of accounts, the Chairman said that the continued increases of consumption were very gratifying. During the past twelve months they had obtained 243 new consumers and had connected up 371 new stoves. During the recent spell of frosty weather on some days the output of gas was 50 p.ct. more than it was for the corresponding days of last year. There was £2329 spent on mains extensions, chiefly in extensions to Copthorne and Shipley Bridge districts. The total expenditure was £578 less than for the same period last year. Though they sold about 4½ p.ct. more gas, the coal and coke bill was down £443. There was a reduced expenditure of £722 on the cost of gas distribution, but public lighting cost £50 more, due to the renewal of several of the street lanterns. Residuals yielded £257 less. Mr. H. Mitchell seconded the adoption of the report, which was carried unanimously. It was proposed by Mr. Randall, seconded by Mr. Tobey, and carried, that the dividends as recommended by the Directors be approved.

### LEWES.

The Half-Yearly Meeting of Lewes Gas Company was held on March 27 at the offices of the Company at Lewes. In the absence of the Chairman (Mr. W. E. Nicholson), owing to ill-health, Mr. A. W. Oke presided. The Directors' report stated that the revenue account showed a profit for the half-year of £1432. The balance of net revenue (as shown in the profit and loss account) was £2163. The Directors recommended that dividends for the past half-year be declared at the rate of 5 p.ct. upon the original capital stock and at the rate of 3½ p.ct. upon the additional capital stock. These dividends (after deduction of income-tax) would amount to £1607. The new vertical retorts installed by the Woodall-Duckham Company continued to give satisfaction, and the new 18-in. main had been laid over the river to Library Corner. Moving the adoption of the report and balance-sheet, the Chairman alluded to the fact that the fashion now seemed to be to have only yearly meetings. He thought the shareholders were safeguarded by having the accounts published half-yearly. He pointed out that £1238 had been expended on the capital account in connection with the new carbonizing installation, and in regard to the new vertical retorts he observed that it was estimated that during the half-year £300 had been saved in wages alone. The balance of profit of £1432 was considerably less than that for the corresponding half of last year, and after paying income-tax, interest on mortgage, and banker's interest, the balance forward would be depleted to £556. A considerable amount had been spent on the revenue account. The past half-year had been a trying one for the Manager, but they had turned the corner, and they were able to recommend the full dividend. The report and balance-sheet were passed, and the recommended dividend was agreed to. Mr. Botley referred to the recent work in carrying the new main over the river, and expressed appreciation of the consideration and co-operation shown by all concerned. He was glad that the Board had seen its way to reduce the price of gas.

### LICHFIELD.

The Annual Meeting of the Lichfield Gas Company was held on March 12 under the Chairmanship of Mr. G. S. Russell. It was reported that the progress of the Company was particularly good in view of the electrical competition in the city. The Directors were again able to declare the usual dividend at the rate of 10 p.ct.

### MID-KENT.

The Directors' report of the Mid-Kent (Snodland) Gas Light and Coke Company for the year ended Dec. 31, 1928, shows that the profits for the year amounted to £6697. A dividend at the rate of 4 p.ct. per annum is proposed.

### THIRSK.

The Directors' report on the year's working of the Thirsk Gas Company shows that during the twelve months a 90,000 c.ft. holder has been erected at a cost of £2899. Dividends are declared at the rate of 3½ p.ct. on the £12,000 share capital, making 6 p.ct. for the year.

### TORQUAY.

Presiding at the Annual Meeting of the Torquay and Paignton Gas Company on Monday, March 25, Mr. H. B. Rossiter said there had been a largely increased sale of gas during the past year, the total output being 540 million therms. The revenue was less by £8000, which was due to reductions in prices; and he was pleased to be able to announce that from the next reading of the meters there would be a further reduction of ½d. per therm, or 2½d. per 1000 c.ft. Discounts would also be allowed of 2½ p.ct. on quantities from 30,000 to 60,000 c.ft., 5 p.ct. from 60,000 to 120,000 c.ft., and 7½ p.ct. above 120,000 c.ft. There had been a considerable fall in the receipts from residual products. The total income was less by £11,950, but there had been a decrease in expenditure of over £14,000. The accounts showed the receipts for the year to be £140,844, as compared with £152,782 in 1927; the balance carried to profit and loss account being £22,871, as against £19,934. The credit balance was £20,298. The Directors recommended full dividends. Mr. F. Dobson commented on the wisdom of amalgamating the Torquay and Paignton Gas Companies, and said he looked to the time when the Company would be called the Torbay Gas Company, and its operations be extended to Newton Abbot, for he had no doubt that in the future there would be one large town extending from Paignton to Newton.

### VENTNOR.

The Directors of the Ventnor Gas and Water Company submit the following report for the year ended Dec. 31, 1928. The balance to the credit of profit and loss account (net revenue) to Dec. 31, 1928, is £3977, out of which the Directors recommend the declara-

tion of a dividend of 8 p.ct. on the original capital shares, and £5 12s. p.ct. on the additional capital shares for the year ended Dec. 31, 1928 (*less* income-tax).

### WOKING.

The announcement of another reduction in the price of gas was made at the 31st Ordinary General Meeting of the Woking District Gas Company, which was held at the Company's Offices, 6, Great Winchester Street, London, on Monday, March 18; Mr. Lawrie Trewby (Chairman of the Directors) presiding. Moving the adoption of the report and accounts, the Chairman said there had been an increased sale of gas of one and three-quarter millions, or 2·16 p.ct. The sale of residuals showed a decrease of £73. This was very good indeed, as most companies had shown very heavy reductions in residuals. The Company's total consumers now numbered 6115, of whom over 4000 were slot consumers. This was a great help, and rather balanced the consumers over summer and winter. They were recommending dividends at the ordinary rates, *plus* £500 to be transferred to reserve fund. Turning to capital account, Mr. Trewby said that they had spent £1688, *less* depreciation of £705, so the total net charge was £983. This was only at the rate of £563 per million c.ft. In 1927 they reduced the price of gas from 1s. 3½d. to 1s. 3d.; in 1928 to 1s. 2d.; and now they were going to have another halfpenny off to make it 1s. 1½d. In a reference to co-partnership, the Chairman said the total amount of this fund was £404, of which £269 had been invested, leaving £134 uninvested. Special purposes had its full quota—£379. This item now stood at £759, which was the maximum amount they could put to the fund. The revenue account was down by £1500, owing to the reduction in the price of gas, but the output was greater. On the motion of the Chairman, seconded by Mr. Bancroft, dividends at the rate of 10 p.ct. per annum on the "A" ordinary stock, 7 p.ct. on the "B" ordinary stock, 5 p.ct. on the "C" preference stock, and 8 p.ct. on the 8 p.ct. redeemable preference stock were approved, together with a motion to transfer £500 to reserve fund. Mr. Bancroft proposed a vote of thanks to the officers and staff for their services during the past six months.

## CHANGES IN THE USE OF COAL.

### Doncaster Coal Exchange Review Low-Temperature Carbonization.

The Second Annual Dinner of the Doncaster Coal Exchange was held at the Danum Hotel on March 27; Mr. J. A. Warriner, the President, in the chair.

Sir Richard A. Pease, submitting the toast of "The Doncaster Coal Exchange," referred to the progress of carbonization processes and their beneficial effect on the coal industry.

The use of pulverized fuel on a ship and the development of low-temperature carbonization, he said, were examples of the more scientific uses of coal. It was not altogether a pleasant thought that possibly a super-excellent trade in house coal might appear to be threatened. He did not, however, say it was threatened yet.

He mentioned the use of coal as a product for low-temperature carbonization. This process had been referred to so largely that he almost hesitated to say another word in its favour. He recalled very well the coal stoppage of 1926 when the London atmosphere was as clear as the day; he also was in New York at a closely approximate date when the bituminous strike was raging. It was the first time he had seen New York blacker than London. Scientists had told them the damage they did by providing the public with coal to burn in the ordinary way was greater than the profits on the whole of the capitalization of their industry. They had to consider the ill-effects of constant fogs and blackness, and soot. This was one of the justifications for putting a high value on the lower size of coal that was suitable for low-temperature carbonization.

## ELECTRICITY GENERATION AND LOW-TEMPERATURE CARBONIZATION.

At the Annual Meeting of the Newcastle-upon-Tyne Electric Supply Company, Ltd., Mr. R. P. Sloan, C.B.E. (the Chairman), in the course of his address to the shareholders, said that, as a result of information given in a paper submitted by him at the World Power Fuel Conference held in London in September last, considerable interest had been aroused in the Company's investigations into the problem of low-temperature coal distillation at the Dunston Power Station. The main problem which it was desired to solve was to evolve some process for the treatment of coal in order to obtain the bye-products and to utilize the resultant semi-coke for the purpose of steam-raising at an electric power generating station. Time would not permit of his going into the difficulties which had to be overcome by those engaged in these investigations before the present measure of success was attained; but as many intricate problems had to be solved, these difficulties were considerable.

In the paper to which he referred, he gave the following particulars with regard to the derivatives from one ton of coal (containing, say, 11,500 B.Th.U. per lb.), which had been obtained at Dunston:

Derivatives from one ton of coal:

(*a*) One gallon of motor spirit, 1 gallon of white spirit, 1·43 gallons of crude paraffin, 0·88 gallons of creosote, 5 gallons of pitch, 0·507 gallon of cresylic acid.

(*b*) Semi-coke and gas having a calorific value equal to 76 p.ct. of the calorific value of one ton of raw coal.

Without detracting from the value of the results so far obtained at Dunston—which he might say represented a great step in advance—he wished again to take the opportunity of dissociating himself entirely from the many misleading and extravagant statements—some of which had been, unfortunately, attributed to him—which were made in the Press and elsewhere, regarding the great economies which might result from the adoption on a large scale of this system of coal treatment. That the technical side of the problem had been solved, there could be no doubt. It was clear, however, that the commercial success of the process depended upon the level of market prices of the bye-products. These, at the present time, were admittedly very low indeed; but, with improved conditions—which, without undue optimism, he thought were bound to come—he looked forward to the time when substantial economies would be obtained from the operation of the process.

They had been working on this problem for some years past in close association with Messrs. Babcock & Wilcox. Recently that firm had extended its interest, and had taken in hand the development of the process.

## GAS REGULATION ACT APPLICATIONS.

### SPECIAL ORDER.

**Padiham Urban District Council.**

To empower the Council to erect and maintain gasholders, and to store gas, on scheduled lands; to authorize them to borrow money; and for other purposes.

### ORDER UNDER SECTION 1.

**Denton Urban District Council.**

To substitute a maximum price per therm for a maximum price per 1000 c.ft. The maximum price per 1000 c.ft. which, under the Order of 1884, may be charged for gas, if the residue of the revenue of the gas undertaking is carried to the credit of the District Fund or General District Rate, is 4s., and the price which the undertakers have asked the Board of Trade to substitute for this is 16d. per therm.

## COAL TRADE REPORTS.

### From Our Own Correspondents.

### NORTH-EAST COAST.

There has not been very much new business done during the past week prior to the holidays, and energies have been largely concentrated upon getting boats away before the break. There are still large numbers waiting for cargoes, and collieries are well supplied with trade for the resumption. The abnormal conditions of the past few weeks are, however, moderating. More Continental coal is coming on the market, and output here is increasing, so that the fancy prices which have been obtainable lately are no longer to be had. There is still good inquiry for forward; but buyers are not inclined to go on at current quotations. It is generally felt, however, that prices will settle down at a higher level than before the boomlet.

Collieries generally are well stemmed for the remainder of April, and quote steadily the current prices. Wear Special gas makes ask 16s. 6d. to 17s. f.o.b., and bests are 15s. 6d. Seconds quote 15s. to 15s. 6d. Coking is still a strong market at 16s. to 17s., and coal for early turns is difficult to obtain. First-class Durham bunkers are very scarce, and none are offering for several weeks ahead; they quote nominally 17s. 6d. Seconds are 15s. 6d. to 16s. Northumberland steams are 16s. 6d. to 17s. for best screened sorts. Gas coke seems plentiful, and is offered at 20s. f.o.b. for shipment.

### YORKSHIRE AND LANCASHIRE.

The output from collieries has, in most instances, been insufficient to meet the demand. The pressure on export continues, particularly in regard to best hards, and the output of secondary descriptions has been fully absorbed. For anything approaching prompt delivery, recent quotations on the basis of 19s. 6d. to 20s. per ton f.o.b. have been firmly maintained. Industrial fuel moves slowly, with indications of firm prices for forward purchase. Washed nuts have become difficult to obtain. Gas coke is easy in view of the milder weather; but furnace coke is inclined to advances. Forward inquiries are not so active, but the colliery position in regard to values is unaltered.

Yorkshire prices on prompt account include washed trebles, 19s.; washed doubles, 18s. to 18s. 6d.; washed singles, 16s. 6d. to 16s. 9d.; washed smalls, 12s. to 12s. 3d. per ton f.o.b. For furnace coke values are firm on the basis of 21s. 6d. to 22s. 6d. per ton, f.o.b.

In the Lancashire market prices are well maintained; industrial fuel having a better tone. Prices in wagons at pit are: Washed doubles, 14s. to 15s. 6d.; washed singles, 13s. to 14s.; rough slack, 9s. to 10s. 6d. per ton.

### MIDLANDS.

Some twelve months contracts for gas coal have been made from Lady Day on terms rather more favourable to collieries than those obtainable a year ago. Pithead prices range upwards from about 14s. With the advent of spring weather and longer days the demand for gas coal is diminishing.

Apart from the break in consumption during the holiday period the volume of business in industrial coals is maintained, but not much more. Distributors have now overtaken the arrears which accumulated during the severe weather. Coke is still scarce, and some of the collieries worked during part of the holidays in order to produce coking material for affiliated ovens. Otherwise there is no market stringency.

Exceptional prices have almost disappeared. In a few cases, however, quotations are definitely higher than before the recent squeeze. There is a very marked decline in the consumption of house coals.

## CURRENT SALES OF GAS PRODUCTS.

### The London Market for Tar, Tar Products, and Sulphate.

London, *March* 28.

There is nothing fresh to report in the London tar products market, and values remain as recorded last week.

### Tar Products in the Provinces.

*March* 28.

As is customary round about Easter, there is not very much business doing in the tar trade; but there is a better tone in the pitch market.

Buyers are trying to purchase a portion of their requirements for next season; but at the ruling figures producers are naturally not interested.

The average prices of gas-works products during the week were: Gas-works tar, 18s. to 23s. Pitch—East Coast, 31s. 6d. to 32s. 6d. f.o.b. West Coast—Manchester, 26s. 6d. to 27s.; Liverpool, 28s. 6d. to 29s. 6d.; Clyde, 28s. 6d. to 29s. 6d. Toluole, naked, North, 1s. 7½d. to 1s. 8½d. Coal-tar crude naphtha, in bulk, North, 9d. to 10d. Solvent naphtha, naked, North, 1s. 3¾d. to 1s. 4¼d. Heavy naphtha, North, 1s. to 1s. 0¼d. Creosote, in bulk, North, liquid, 3¾d. to 4⅛d.; salty, 3½d. to 3⅝d.; Scotland, 3¾d. to 4¼d. Heavy oils, in bulk, North, 6d. to 6¼d. Carbolic acid, 60 p.c.t., 1s. 10d. to 1s. 10½d. prompt. Naphthalene, £13 to £15; salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.c.t., purely nominal; "B" quality, unsaleable.

### Benzole Prices.

The following are considered to be the market prices to-day:

| | s. d. | s. d. | |
|---|---|---|---|
| Crude benzole . . . | 1 0 | to 1 1 | per gallon at works |
| Motor ,, . . . | 1 7 | ,, 1 8 | ,, ,, ,, |
| 90 p.c.t. ,, . . . | 1 9 | ,, 1 10 | ,, ,, ,, |
| Pure ,, . . . | 2 0 | ,, 2 1 | ,, ,, ,, |

## TRADE NOTES.

**Metropolitan-Vickers Electrical Company, Ltd.**

This firm have sent us a very attractive calendar—the fifteenth of the "Girl" series—for 1929-30.

**Expanded Metal Company, Ltd.**

The new address of this firm is: Burwood House, Caxton Street, Westminster, S.W. 1; telephone numbers, Victoria 2156, 2157, and 2158.

**New Gasholder for Mytholmroyd.**

The Hebden Bridge and Mytholmroyd Gas Board have accepted the tender of Messrs. Robert Dempster & Sons, Ltd., of Elland, for the erection of a new gasholder at Mytholmroyd, of 500,000 c.ft. capacity, to replace the holder which collapsed owing to effects of the recent long frost.

**"Tungstone" Accumulators.**

The Tungstone Accumulator Company, Ltd., have published a folder setting out the many advantages of the accumulators which they manufacture. The firm guarantee that no lead oxides are cast in a "Tungstone" positive plate. The casting is done quickly under-pressure. The finished plate, after chilling, is mechanically ejected from the mould.

**Microid Pyrometers.**

Messrs. Griffin & Tatlock, Ltd., of Kemble Street, Kingsway, W.C. 2, have issued a brochure dealing with pyrometers, chart recorders, and other types of indicators and accessories as manufactured by them. The thermo-electric pyrometers listed in the publication are suitable for the measurement of most of the ranges of temperature met with in industrial processes and research work. They are applicable to a great variety of conditions. They indicate or permanently record the temperature, and are robust, easy to use, and inexpensive to maintain. This list is in two parts. The first contains a description of certain standard outfits, while the second is a price list. Some of the processes to which pyrometers have been successfully applied are also enumerated. Messrs. Griffin & Tatlock, Ltd., have specialized in thermo-electric pyrometry since its inception, and their experience of the subject is very considerable. In redesigning the instruments in this list the most recent developments in pyrometrical practice have been incorporated.

## CONTRACTS OPEN.

**Gasholder and Steel Tank.**

The Malvern Urban District Council invite tenders for a three-lift spiral-guided gasholder and steel tank, &c. [See advert. on p. 50.]

**Lower Charges at Haworth.**—The Haworth Urban District Council, on March 26, approved a reduction in the charge for gas from 2s. 7d. to 2s. 6d. per 1000 c.ft. The reduction dates from April 1.

**Dewsbury's Success.**—A statement issued to members of Dewsbury Town Council in regard to the Corporation's gas undertaking shows that the cost of gas manufacture in that town is 8·87d. per 1000 c.ft. The cost of coal (deducting revenue from coke and tar) is 2·77d. per 1000 c.ft. of gas made. Dewsbury's profit is 19·87d. per 1000 c.ft. The Dewsbury undertaking, which in recent years has been exceedingly successful, has wiped out a debt of £50,000, has had the carbonizing plant rebuilt, and has reduced the price to consumers from 5s. to 3s. 9d. per 1000 c.ft.

**Water Gas Plant for Sedgley.**—At a recent meeting of the Sedgley Urban Council, the minutes of the Gas Committee contained a resolution that the Gas Manager be instructed to prepare a scheme and estimate for augmenting the supply of gas by the installation of a carburetted water gas plant of a capacity of about 200,000 c.ft. per day, with such auxiliary apparatus in connection therewith as might be found necessary. Councillor Pratt said that the Committee had had under consideration for a long time the question of enlarging the gas-works. Notwithstanding the keen competition in the district the sales were increasing. The report was adopted.

**Hessle Gas Company.**—The following announcement is made by the Company: The prices charged each quarter for gas supplied as from Dec. 31, 1928, will be as follows: For gas supplied within the Urban District of Hessle and the Parish of Anlaby: For the first 50 therms or part thereof, 11·6d. per therm; for the next 50 therms or part thereof, 11d. per therm; for the next 100 therms or part thereof, 10d. per therm; for the next 100 therms or part thereof, 9d. per therm; for the next 100 therms or part thereof, 8d. per therm; for the next 100 therms or part thereof 7d. per therm; and for all over 500 therms, 6d. For gas supplied outside the said area, 1·2d. per therm in excess of the above prices.

**Gas Exhibition at Newtownards.**—A three days' gas exhibition arranged by Messrs. R. & A. Main, Ltd., London and Falkirk, on behalf of the Newtownards Gas Committee has just been held in the Newtownards Town Hall. There was a varied display of cookers, fires, &c., and the large boardroom was transformed into a model bedroom, sitting room, and bathroom. Mr. W. Cole and Miss Jessie Brownlie, of Messrs. Main, delivered a series of explanatory lectures to large and interested audiences. Messrs. George Bray & Sons, of Leeds, had an extensive display of gas mantles, shades, &c. At the opening ceremony Mr. R. J. Beckett (Chairman of the Gas Committee) drew special attention to the automatic oven-heat controller.

**Coal Shortage at Scunthorpe.**—At the February meeting of Scunthorpe Urban Council, Mr. G. Walshaw, Chairman of the Gas Committee, reported that there had been a difficulty in getting supplies of coal for the gas-works from the contractors. At the March meeting of the Council, however, Mr. Walshaw said he wished to apologize for misrepresenting the state of affairs last month. The difficulty had been really due to the Committee's not contracting for sufficient supplies of coal, with the result that they had had to buy odd lots. He wished to make it clear that it was not due to the Wath Main Colliery Company, from whom they obtained their coal, for they had delivered the supplies contracted for right up to the day. It was entirely a fault of the Committee.

**Grays and Tilbury Gas Company.**—The employees and staff of the Grays and Tilbury Gas Company were entertained by the Directors of the Company at a social evening, at the Bridge Road Schools, on Saturday evening, when a most successful and enjoyable evening was spent. The guests, numbering approximately 300, were welcomed on behalf of the Board by the Engineer and Manager, Mr. A. W. Sumner. The Secretary, Mr. W. F. Whittaker, associated himself with this welcome, and read letters from the Directors regretting their inability to be present. Mr. Whittaker suggested that, on behalf of all present, a letter be sent to Mr. C. E. Harford, the Distribution Superintendent, wishing him a speedy recovery from the indisposition which prevented his attendance. The success of the evening was due in no small measure to Mr. E. W. Amos (Secretary of the Welfare Association), to the Committee of the Association, and to Mr. W. H. Fraser.

Last Thursday evening the electric current at Deal failed for half-an-hour, causing much inconvenience.

It is reported that one man was killed and another seriously injured as a result of a gasholder explosion on March 22 at Aubervilliers, a suburb of Paris.

The Chorley Gas Committee recommend the application to the Ministry of Health for sanction to borrow £28,576 for alterations, additions, and improvements at the gas-works.

It is proposed that the electrical transformer chamber at the Bradford Corporation's Birkshall Gas-Works be enlarged at an estimated cost of £2100. This is the result of extended use of current in connection with the gas plant.

A reduction of 2s. 4d. in the pound in the local rates levied by the Knaresborough Urban District Council for the next year is made possible owing to the profit on the recent sale of the gas-works undertaking to the Harrogate Gas Company.

A gas explosion, believed to have been due to a defect in an old-fashioned chandelier, occurred in a house in Blackpool on the morning of March 24. The explosion broke several windows and blew down a wall between the sitting-room and the hall. Two occupants were slightly injured.

# STOCK AND SHARE LIST.

[For Stock Market Report, see earlier pages.]

| Issue. | Share. | When ex-Dividend. | Dividends. Prev. Hf.Yr | Dividends. Last Hf. Yr. | NAME. | Quotations. Mar. 28. | Rise or Fall on Week. | Transactions Lowest and Highest Prices. |
|---|---|---|---|---|---|---|---|---|
| £ | | | %p.a | % p.a. | | | | |
| 171,978 | Stk. | Feb. 7 | 5 | 5 | Aldershot 5 p.c. max. C. | 70–75 | .. | .. |
| 412,992 | ,, | ,, | 4 | 4 | Do. 4 p.c. Pref. | 73–76 | .. | .. |
| 1,551,868 | ,, | Sept. 27 | 7 | 7½ | Alliance & Dublin Ord. | 9½–102 | .. | 99½–100¾ |
| 374,000 | ,, | Jan. 10 | 4 | 4 | Do. 4 p.c. Deb. | 63–66 | .. | .. |
| 522,655 | ,, | Mar. 7 | 7 | 7 | Barnet Ord. 7 p.c. | 112–115 | .. | .. |
| 800,000 | 1 | Oct 11 | 1/7½ | 1/4⅜ | Bombay, Ltd. | 20/–22/- | .. | .. |
| 172,500 | 10 | Mar. 7 | 8½ | 9 | Bournemouth 5 p.c. | 12⅜–13½ | .. | .. |
| 560,050 | 10 | ,, | 7 | 7 | Do. B 7 p.c. | 12½–12⅝ | .. | .. |
| 439,160 | 10 | ,, | 6 | 6 | Do. Pref. 6 p.c. | 10¾–11½ | .. | 11 1/16–£11/1/9 |
| 60,000 | Stk. | Jan. 10 | 3 | 3 | Do. 3 p.c. Deb. | 55–58 | .. | .. |
| 153,025 | ,, | ,, | 4 | 4 | Do. 4 p.c. Deb. | 74–77 | .. | .. |
| 257,900 | ,, | Mar. 21 | 7½ | 7½ | Brighton & Hove 6 p.c. Con. | 113–116* | .. | .. |
| 371,880 | ,, | ,, | 6⅔ | 6⅔ | Do. 5 p.c. Con. | 99–102* | .. | .. |
| 1,927,500 | ,, | Feb. 21 | 5 | 5 | Bristol 5 p.c. max. | 88½–83½a | .. | .. |
| 866,000 | ,, | Sept. 27 | 7 | 8 | British Ord. | 118–121 | .. | .. |
| 100,000 | ,, | Dec. 20 | 7 | 7 | Do. 7 p.c. Pref. | 115–120 | .. | .. |
| 190,000 | ,, | ,, | 4 | 4 | Do. 4 p.c. Red. Deb. | 73–76 | .. | .. |
| 200,000 | ,, | ,, | 5 | 5 | Do. 5 p.c. Red. Deb. | 93–96 | .. | 96 |
| 100,000 | 10 | Dec. 6 | 8 | 6 | Cape Town, Ltd. | 8–9 | .. | .. |
| 100,000 | 10 | Oct. 25 | 4½ | 4½ | Do. 4½ p.c. Pref. | 6½–7½ | .. | .. |
| 150,000 | Stk. | Dec. 20 | 4½ | 4½ | Do. 4½ p.c. Deb. | 73–78 | .. | .. |
| 496,860 | ,, | Feb. 21 | 6 | 6 | Cardiff Con. Ord. | 97–100 | .. | .. |
| 927,860 | ,, | Jan. 10 | 7½ | 7½ | Do. 7½ p.c. Red. Deb. | 100–103 | .. | .. |
| 187,150 | ,, | Feb 21 | 5 | 6½ | Chester 5 p.c. Ord. | 87½–92½b | .. | .. |
| 79,185 | 1 | Oct. 11 | †2/- | †2/- | Colombo Ltd. Ord. | 36/–38/- | .. | .. |
| 24,495 | 1 | ,, | 1/4½ | 1/4½ | Do. 7 p.c. Pref. | 21/–23/- | .. | .. |
| 375,402 | 1 | Oct. 11 | 1/9½ | 1/9½ | Colonial Gas Assn. Ld. Ord. | 24/6–26/6 | .. | .. |
| 187,848 | 1 | ,, | 1/7½ | 1/7½ | Do. 8 p.c. Pref. | 21/–23/- | .. | .. |
| 3,073,280 | Stk. | Feb. 21 | 5 | 7 | Commercial Ord. | 98–101 | .. | 98 |
| 475,000 | ,, | Dec. 20 | 3 | 3 | Do 3 p.c. Deb. | 56–59 | .. | £6½ |
| 900,000 | ,, | Sept. 27 | 11 | 11 | Continental Union, Ltd. | 120–125 | –2 | 120½–123 |
| 900,000 | ,, | ,, | 7 | 7 | Do. 7 p.c. Pref. | 123 128 | .. | 124½–127 |
| 727,560 | ,, | Feb. 21 | 7 | 7 | Croydon sliding scale | 109–112 | .. | .. |
| 402,100 | ,, | ,, | 5 | 5 | Do. max. div. | 83 86 | .. | .. |
| 542,270 | ,, | Mar. 7 | 7 | 10 | Derby Con. | 112–117e | .. | .. |
| 65,000 | ,, | Dec. 20 | 4 | 4 | Do. Deb. | 70–72e | .. | .. |
| 909,000 | ,, | Mar. 7 | 5 | 5 | East Hull Ord. 5 p.c. | 73–75 | .. | .. |
| 1,002,180 | 10 | Mar. 21 | †4 | †7 | European, Ltd. | 19–21* | +½ | 17⅞–20 1/16 |
| 13,705,480 | Stk. | Feb. 21 | 5½ | 5⅝ | Gas Light & Coke 4 p.c. Ord. | 18/9–19/3f | .. | 18/9¾–19/2½ |
| 2,600,000 | ,, | ,, | 8½ | 8½ | Do. 8½ p.c. max. | 63–65 | –1 | 64 |
| 4,187,020 | ,, | ,, | 4 | 4 | Do. 4 p.c. Con. Pref. | 76–79 | .. | 75½–77½ |
| 5,609,820 | ,, | Dec. 20 | 3 | 3 | Do. 3 p.c. Con. Deb. | 58½–60½ | .. | 58–60 |
| 3,643,770 | ,, | ,, | 5 | 5 | Do. 5 p.c. Red. Deb. | 98–101 | .. | 99–101½ |
| 92,500 | ,, | Mar. 21 | 7 | 7 | Hastings & St L. 5 p.c. Conv | 96–101* | .. | 100 |
| 258,740 | ,, | ,, | 5½ | 5½ | Do. 8½ p.c. Conv. | 76–81* | .. | .. |
| 70,000 | 10 | Oct. 11 | †10 | †10 | Hongkong & China, Ltd. | 13–14 | .. | .. |
| 218,200 | Stk. | Mar. 7 | 5½ | 6 | Hornsey Con. 8½ p.c. | 86–89 | .. | .. |
| 1,976,000 | ,, | Nov. 8 | 10 | 10 | Imperial Continental Cap. | 385–405 | +10 | 371–399 |
| 223,130 | ,, | Feb 7 | 8½ | 8½ | Do. 8½ p.c. Red. Deb. | 69–72 | .. | .. |
| 235,242 | ,, | Mar. 7 | 7½ | 8 | Lea Bridge 5 p.c. Ord. | 117 120 | .. | .. |
| 2,145,907 | ,, | Feb. 21 | 5½ | 6½ | Liverpool 5 p.c. Ord. | 94–95b | .. | .. |
| 600,000 | ,, | Mar 21 | 7 | 7 | Do. 7 p.c. Red. Pref. | 100–102b | –2 | .. |
| 185,786 | ,, | Feb. 21 | 9 | 8 | Maidstone 5 p.c. Cap. | 124–129 | .. | .. |
| 63,480 | ,, | Dec. 20 | 3 | 3 | Do. 3 p.c. Deb. | 54–57 | .. | .. |
| 15,000 | 5 | Dec. 6 | †8 | †8 | Malta & Mediterranean | 6½–6¾ | .. | .. |
| 392,000 | — | — | — | — | Metrop't'n (of Melbourne) 5½ p.c. Red. Deb. | 100 103 | .. | .. |
| 641,920 | Stk. | Nov. 22 | †7 | †5 | Montevideo, Ltd. | 104–108 | .. | 107 |
| 2,961,818 | ,, | Feb. 21 | 5 | 5⅛ | Newcastle & Gateshead Con. | 17/–17/6d f | .. | .. |
| 682,836 | ,, | ,, | 4 | 4 | Do. 4 p.c. Pref. | 72⅝–73¾d | .. | .. |
| 691,705 | ,, | Dec. 20 | 8½ | 8½ | Do. 8½ p.c. Deb. | 68½–69½d | .. | .. |
| 131,780 | ,, | Mar 7 | 7/1/0 | 7/1/0 | North Middlesex 6 p.c. Con. | 105–110 | .. | .. |
| 800,000 | ,, | Nov. 22 | 7 | 9 | Oriental, Ltd. | 116–120 | .. | 118 |
| 188,120 | ,, | Dec. 20 | 7½ | 8 | Plym'th & Stonehouse 5 p.c. | 108–111 | .. | .. |
| 626,416 | ,, | Feb. 21 | 7⅛ | 8⅛ | Portsm'th Con. Stk. 4p.c. Std. | 113–118 | .. | .. |
| 241,446 | ,, | ,, | 5 | 5 | Do. 5 p.c. max. | 81–84 | .. | .. |
| 2,334,464 | 1 | — | — | — | Primitiva Ord. | 30/–32/- | –1/- | 30/–31/9 |
| 244,500 | 100 | Dec. 3 | 4 | 4 | Do. 4 p.c. Red. Deb. | 91–94 | .. | .. |
| 695,000 | Stk. | Jan. 24 | 4 | 4 | Do. 4 p.c. Red. Deb. 1911 | 78–80 | .. | .. |
| 416,345 | ,, | Dec. 20 | 4 | 4 | Do. 4 p.c. Cons. Deb. | 78–80 | .. | .. |
| 150,000 | 10 | Mar. 21 | 6 | 6 | San Paulo 6 p.c. Pref. | 8½–8⅞* | .. | .. |
| 1,736,968 | Stk. | Mar. 21 | 6½ | 6⅝ | Sheffield Cons. | 106–108s | .. | .. |
| 95,000 | ,, | Jan 10 | 4 | 4 | Do. 4 p.c. Deb. | 74–77s | .. | .. |
| 90,000 | 10 | June 14 | †3 | †4 | South African | 4–6 | .. | 5 |
| 6,999,895 | Stk. | Feb. 21 | 5 | 7½ | South Met. Ord. | 105 107 | –1 | 105¼–106½ |
| 500,000 | ,, | ,, | 6 | 6 | Do. 6 p.c. Irred. Pf. | 108–111 | –1 | 109–109 3/16 |
| 1,895,445 | ,, | Jan. 10 | 8 | 8 | Do. 8 p.c. Deb. | 58–60 | .. | .. |
| 794,000 | ,, | Mar 7 | 6½ | 6½ | Do. 6½ p.c. Red. Db. | 99–101 | .. | .. |
| 91,500 | ,, | Mar. 7 | 8½ | 8½ | South Shields Con. | 106½–107½d | .. | .. |
| 1,543,795 | ,, | Feb. 21 | 6½ | 6½ | South Suburban Ord. 6 p.c. | 107–110 | .. | .. |
| 462,837 | ,, | Dec. 20 | 5 | 5 | Do. 5 p.c. Deb. | 98–101 | .. | 99–99½ |
| 947,740 | ,, | Mar. 7 | 5 | 5 | South'mpton Ord. 5 p.c. max. | 76–78 | .. | 77–78 |
| 131,275 | ,, | Dec. 20 | 4 | 4 | Do. 4 p.c. Deb. | 74 75 | .. | 73 |
| 980,000 | ,, | Feb. 21 | 7 | 7 | Swansea 7 p.c. Red. Pref. | 100–102 | .. | 101 |
| 900,000 | ,, | Dec. 20 | 6½ | 6½ | Do. 6½ p.c. Red. Deb. | 100–102 | .. | .. |
| 1,004,275 | ,, | Mar. 7 | — | 6½ | Tottenham District Ord. | 102–105 | .. | 102½–104½ |
| 400,000 | ,, | ,, | 5½ | 5½ | Do. 5½ p.c. Pref. | 96–98 | .. | .. |
| 191,256 | ,, | Dec. 6 | 4 | 4 | Do. 4 p.c. Deb. | 75–78 | .. | .. |
| 289,094 | ,, | Mar. 7 | 6⅞ | 7 | Uxbridge, Maidenhead, & Wycombe 5 p.c. | 98–98 | .. | .. |
| 98,880 | ,, | ,, | 5 | 5 | Do. 5 p.c. pref. | 85–90 | .. | .. |
| 80,000 | ,, | Feb. 21 | 8½ | 9 | Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c. | 147–152 | .. | .. |
| 355,884 | ,, | ,, | 7½ | 7½ | Do. B 8½ p.c. | 125–130 | .. | 128½–129 |
| 424,585 | ,, | ,, | 6⅞ | 6⅞ | Do. C and New | 102–107 | .. | 104–105½ |
| 259,000 | ,, | ,, | 6⅞ | 7½ | Do. Wimbledon 5 p.c. | 115–120 | .. | 114–119 |
| 98 070 | ,, | ,, | 7⅛ | 7⅛ | Do. Epsom 5 p.c. | 126–131 | +1 | 129 |
| 200,000 | ,, | ,, | 5 | 5 | Do. 5 p.c. Pref | 90–95 | .. | .. |
| 98,416 | ,, | Dec. 20 | 3 | 3 | Do. 3 p.c. Deb. | 56–59 | .. | .. |
| 284,742 | ,, | ,, | 4 | 4 | Do. 4 p.c. Deb. | 77–80 | .. | .. |
| 327,500 | ,, | ,, | 5 | 5 | Do. 5 p.c. Deb. | 97–100 | .. | .. |

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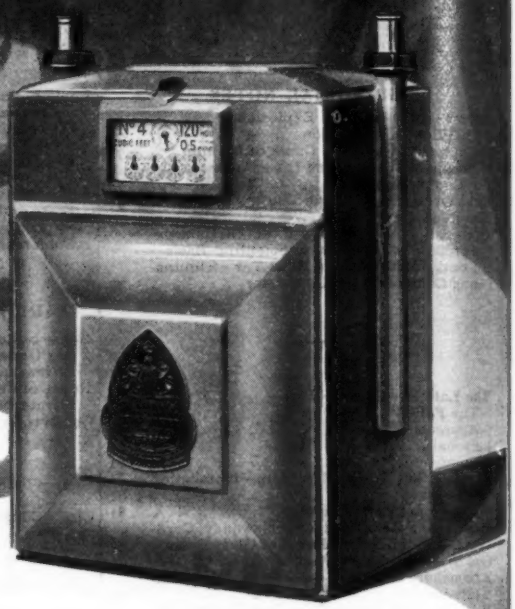

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